# City of Diamond Bar

## Natural Hazards Mitigation Plan

Adopted:
October 5, 2004 by the City of Diamond Bar City Council
by Resolution No. 2004-57

## Special Thanks & Acknowledgments


City of Diamond Bar City Council:
Bob Zirbes, Mayor
Carol Herrera, Mayor Pro Tem
Wen P. Chang, Council Member
Bob Huff, Council Member
Debby O'Connor, Council Member

Linda Lowry, City Manager

City of Diamond Bar Natural Hazards Mitigation Planning Committee:

City of Diamond Bar Cmty. & Dev. Serv. Dept.:
Jim DeStefano, Deputy City Manager

City of Diamond Bar Public Works Division:
David Liu, Director of Public Works
Sharon Gomez, Senior Management Analyst

City of Diamond Bar Building and Safety:
Dennis Tarango, Building Official
Carlos Chacon, Building & Safety Technician

City of Diamond Bar Community Services:
Bob Rose, Director of Community Services
Teresa Ilasin, Senior Management Analyst

John R. Bingham, Consultant/Project Manager

City of Diamond Bar Admin. Services Department:
Dave Doyle, Deputy City Manager

City of Diamond Bar Public Information:
April Blakey, Public Information Manager

Los Angeles County Fire Department:
John Nieto, Assistant Chief
Thomas G. Page, Battalion Chief
Joe Rumfola, Battalion Chief
Ron Watson, Battalion Chief
Leticia Pacillas, Community Liaison

Los Angeles County Sheriffs Department:
Joe Maxey, Lieutenant

Local Agency Support:

Office of Disaster Management, Area D: Brenda Hunemiller, Coordinator

California Division of Forestry
Federal Emergency Management Agency, Region IX
Southern California Association of Governments
Governor's Office of Emergency Services

Dave Amdahl, American Red Cross
Tina Javid, Public Affairs Manager, The Gas Company
Richard S. Meza, Region Manager, Southern California Edison
Kelly Shivertaker, Emergency Planning & Preparedness Manager, So. Ca. Edison
Thomas M. Monk, Walnut Valley Water District
Amy Mc Elwain, Dir. Risk Management Bus. Services, Pomona Unified School District
Joe Williams, Director of Maintenance & Operations, Pomona Unified School District
Diane Hockersmith, Assistant Superintendent, Walnut Valley Unified School District
Carrie Cruz, Ron Shinn, City of Pomona

For questions or comments regarding the Natural Hazards Mitigation Plan or for information regarding location of copies of the Plan, please contact the City of Diamond Bar City Manager's office at (909) 839-7010, City of Diamond Bar City Hall, 21825 Copley Drive, Diamond Bar, CA. 91765.

Note:

The information on the maps in this plan was derived from the City of Diamond Bar, CA and the County of Los Angeles, CA. Care was taken in the creation of these maps, but is provided "as is". The City of Diamond Bar and the County of Loa Angeles cannot accept any responsibility for any errors, omissions or positional accuracy, and therefore, there are no warranties that accompany these maps. Although information from land surveys may have been used in the creation of these maps, in no way do these maps present or constitute a land survey. Users are cautioned to field verify information on these maps before making any decisions.

# Index

## List of Maps

# Part I: Mitigation Action Plan

# Executive Summary

## Diamond Bar Natural Hazards Mitigation Plan

The Diamond Bar Natural Hazards Mitigation Plan (NHMP) establishes the City's strategy to put into practice improvements and programs to lessen community impacts in the event of natural hazard events. This Plan has been prepared pursuant to the federal Disaster Mitigation Act of 2000 (DMA 2K) the NHMP comprehensively identifies potential natural hazards, the extent of the risks posed by the hazards, the vulnerabilities of the City to those hazards and the action the City will take to mitigate or reduce the potential impact of the hazards.

## Five -Year Action Plan Matrix

The City of Diamond Bar Natural Hazards Mitigation Action Plan includes resources and information to assist City residents, public and private sector organizations, and others interested in participating in planning for natural hazards. The mitigation plan provides a list of activities that may assist City of Diamond Bar in reducing risk and preventing loss from future natural hazard events. The action items address multi-hazard issues, as well as activities for earthquakes, earth movements, flooding, wildfires and wind storms. Please see Appendix A to review the Five-Year Plan Matrix.

## How is the Plan Organized?

The Mitigation Plan contains a five-year action plan matrix, background on the purpose and methodology used to develop the mitigation plan, a profile of City of Diamond Bar, sections on five natural hazards that occur within the City, and a number of appendices. All of the sections are described in detail in Section 1, Introduction.

## Who Participated in Developing the Plan?

The City of Diamond Bar Natural Hazards Mitigation Action Plan is the result of a collaborative effort between City of Diamond Bar citizens, public agencies, non-profit organizations, the private sector, and regional and state organizations. Public participation played a key role in development of goals and action items. Interviews were conducted with stakeholders across the City, and two public workshops were held to include City of Diamond Bar residents in plan development. A project Planning Committee guided the process of developing the plan.

The Planning Committee was comprised of representatives from:
City of Diamond Bar City Manager's Office
City of Diamond Bar Community and Development Services Department
City of Diamond Bar Administrative Services Department
City of Diamond Bar Building and Safety Division
City of Diamond Bar Finance Division
City of Diamond Bar Planning Division
City of Diamond Bar Public Information Division
City of Diamond Bar Public Works Division
City of Diamond Bar Community Services Division
Los Angeles County Sheriff's Department

Los Angeles County Fire Department
Local Agency Support:
Office of Disaster Management, Area D

Federal Emergency Management Agency
Southern California Association of Governments
Governor's Office of Emergency Services

**What is the Plan Mission?**

The mission of the City of Diamond Bar Natural Hazards Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the City towards building a safer, more sustainable community.

**What are the Plan Goals?**

The plan goals describe the overall direction that City of Diamond Bar agencies, organizations, and citizens can take to work toward mitigating risk from natural hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations outlined in the action items.

**Protect Life and Property**
Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural hazards.
Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.
Improve hazard assessment information to make recommendations for discouraging new development in high hazard areas and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

**Public Awareness**
Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.
Provide information on educational tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.

**Natural Systems**
Balance natural resource management, and land use planning with natural hazard mitigation to protect life, property, and the environment.
Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.

**Partnerships and Implementation**
Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.

Encourage leadership within public and private sector organizations to prioritize and implement local and regional hazard mitigation activities.

**Emergency Services**
Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure. Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry. Coordinate and integrate natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

**How are the Action Items Organized?**

The action items are a listing of activities in which City agencies and citizens can be engaged to reduce risk. Each action item includes an estimate of the time line for implementation. Short-term action items are activities that City agencies may implement with existing resources and authorities within one to two years. Long-term action items may require new or additional resources or authorities, and may take between one and five years (or more) to implement.

The action items are organized within the following matrix, which lists all of the multi-hazard and hazard-specific action items included in the mitigation plan. Data collection and research and the public participation process resulted in the development of these action items (see Appendix C). The matrix includes the following information for each action item:

**Coordinating Organization:** The coordinating organization is the public agency with regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation. Coordinating organizations may include local, county, or regional agencies that are capable of or responsible for implementing activities and programs.

**Time line:** Action items include both short and long-term activities. Each action item includes an estimate of the time line for implementation. Short-term action items are activities which City agencies are capable of implementing with existing resources and authorities within one to two years. Long-term action items may require new or additional resources or authorities, and may take between one and five years (or more) to implement.

**Ideas for Implementation:** Each action item includes ideas for implementation and potential resources, which may include grant programs or human resources. The matrix includes the page number within the mitigation plan where this information can be found.

**Plan Goals Addressed:** The plan goals addressed by each action item are included as a way to monitor and evaluate how well the mitigation plan is achieving its goals once implementation begins. The plan goals are organized into the following five areas:
Protect Life and Property
Public Awareness
Natural Systems
Partnerships and Implementation
Emergency Services

**Partner Organizations:** The Partner organizations are not listed with the individual action items or in the plan matrix. Partner organizations are listed in Appendix C, of this plan and are agencies or public/private sector organizations that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization. The partner organizations listed in the Resource Directory of the City of Diamond Bar Natural Hazards Mitigation Plan are potential partners recommended by the project steering committee, but were not necessarily contacted during the development of the Mitigation Plan. Partner organizations should be contacted by the coordinating organization to establish commitment of time and resources to action items.

**Constraints**: Constraints may apply to some of the action items. These constraints may be a lack of city staff, lack of funds, or vested property rights which might expose the City to legal action as a result of adverse impacts on private property.

**How Will the Plan be Implemented, Monitored, and Evaluated?**

The Plan Maintenance Section of this document details the formal process that will ensure that the City of Diamond Bar Natural Hazards Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how the City will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how the City of Diamond Bar government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the City's General Plan, Capital Improvement Plans, and Building & Safety Codes.

**Plan Adoption**

Adoption of the Natural Hazards Mitigation Plan by the local jurisdiction's governing body is one of the prime requirements for approval of the plan. Once the plan is completed, the City Council will be responsible for adopting the City of Diamond Bar Natural Hazards Mitigation Plan. The local agency governing body has the responsibility and authority to promote sound public policy regarding natural hazards. The City Council will periodically need to re-adopt the plan as it is revised to meet changes in the natural hazard risks and exposures in the community. The approved Natural Hazards Mitigation Plan will be significant in the future growth and development of the community.

**Coordinating Body**

A City of Diamond Bar Natural Hazards Mitigation Action Committee will be responsible for coordinating implementation of Plan action items and undertaking the formal review process. The City Manager will assign representatives from City agencies, including, but not limited to, the current Natural Hazards Mitigation Planning Committee members.

**Convener**

The City Council will adopt the City of Diamond Bar Natural Hazards Mitigation Plan, and the Hazards Mitigation Action Committee will take responsibility for plan implementation. The City Manager or designee will serve as a convener to facilitate the Natural Hazards Mitigation Action Committee meetings, and will assign tasks such as updating and presenting the Plan to the

members of the committee. Plan implementation and evaluation will be a shared responsibility among all of the Natural Hazards Action Committee Members.

**Implementation through Existing Programs**

The City of Diamond Bar addresses statewide planning goals and legislative requirements through its General Plan, Capital Improvement Plans, and City Building & Safety Codes. The Natural Hazards Mitigation Plan provides a series of recommendations that are closely related to the goals and objectives of these existing planning programs. The City of Diamond Bar will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

**Economic Analysis of Mitigation Projects**

The Federal Emergency Management Agency's approaches to identify costs and benefits associated with natural hazards mitigation strategies or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards can provide decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

**Formal Review Process**

The City of Diamond Bar Natural Hazards Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and time line, and identifies the local agencies and organizations participating in plan evaluation. The convener will be responsible for contacting the Natural Hazards Mitigation Action Committee members and organizing the annual meeting. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

**Continued Public Involvement**

City of Diamond Bar is dedicated to involving the public directly in the continual review and updates of the Natural Hazards Mitigation Plan. Copies of the Plan will be catalogued and made available at City Hall and at the public library. The existence and location of these copies will be publicized in the “Diamond Bar City News” newsletter. Public comments related to the Plan will be kept with the City Manager’s office. In addition, copies of the Plan and any proposed changes will be posted on the City website. This site will also contain an email address and phone number to which people can direct their comments and concerns.

# SECTION 1: INTRODUCTION

Throughout its history, the residents of the City of Diamond Bar have dealt with the various natural hazards affecting the area. Photos, journal entries, and newspapers from the 1800's show that the residents of the area dealt with earthquakes, earth movements, flooding, wildfires and wind storms.

Although there were fewer people in the area, the natural hazards adversely affected the lives of those who depended on the land and climate conditions for food and welfare. As the population of the City continues to increase, the exposure to natural hazards creates an even higher risk than previously experienced.

The City of Diamond Bar is the 33rd most populous City in Los Angeles County of the 88 cities, and offers the benefits of living in a Mediterranean type of climate. The City is characterized by the unique and attractive landscape that makes the area so popular. However, the potential impacts of natural hazards associated with the terrain make the environment and population vulnerable to natural disaster situations.

The City is subject to earthquakes, earth movements, flooding, wildfires and wind storms. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the City. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from these natural disasters.

## Why Develop a Mitigation Plan?

As the costs of damage from natural disasters continue to increase, the community realizes the importance of identifying effective ways to reduce vulnerability to disasters. Natural Hazards Mitigation Plan assist communities in reducing risk from natural hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the City.

The Plan provides a set of action items to reduce risk from natural hazards through education and outreach programs and to foster the development of partnerships, and implementation of preventative activities such as land use programs that restrict and control development in areas subject to damage from natural hazards.

The resources and information within the Mitigation Plan:

(1) establish a basis for coordination and collaboration among agencies and the public in the City of Diamond Bar;
(2) identify and prioritize future mitigation projects; and
(3) assist in meeting the requirements of federal assistance programs.

The Mitigation Plan works in conjunction with other City plans, including the City General Plan and Emergency Operations Plans.

**Whom Does the Mitigation Plan Affect?**

The City of Diamond Bar Natural Hazards Mitigation Plan affects the entire City. The Base Map (Map 1) shows major roads in the City of Diamond Bar. This Plan provides a framework for planning for natural hazards. The resources and background information in the Plan is applicable City-wide, and the goals and recommendations can lay groundwork for local mitigation plans and partnerships.

**Natural Hazards Land Use Policy in California**

Planning for Natural Hazards should be an integral element of any city's land use planning program. All California cities and counties have General Plans and the implementing ordinances that are required to comply with the statewide planning regulations.

The continuing challenge faced by local officials and state government is to keep the network of local plans effective in responding to the changing conditions and needs of California's diverse communities, particularly in light of the very active seismic region in which we live.

This is particularly true in the case of planning for natural hazards where communities must balance development pressures with detailed information on the nature and extent of hazards.

Planning for Natural Hazards, calls for local plans to include inventories, policies, and ordinances to guide development in hazard areas. These inventories should include the compendium of hazards facing the community, the built environment at risk, the personal property that may be damaged by hazard events and most of all, the people who live in the shadow of these hazards.

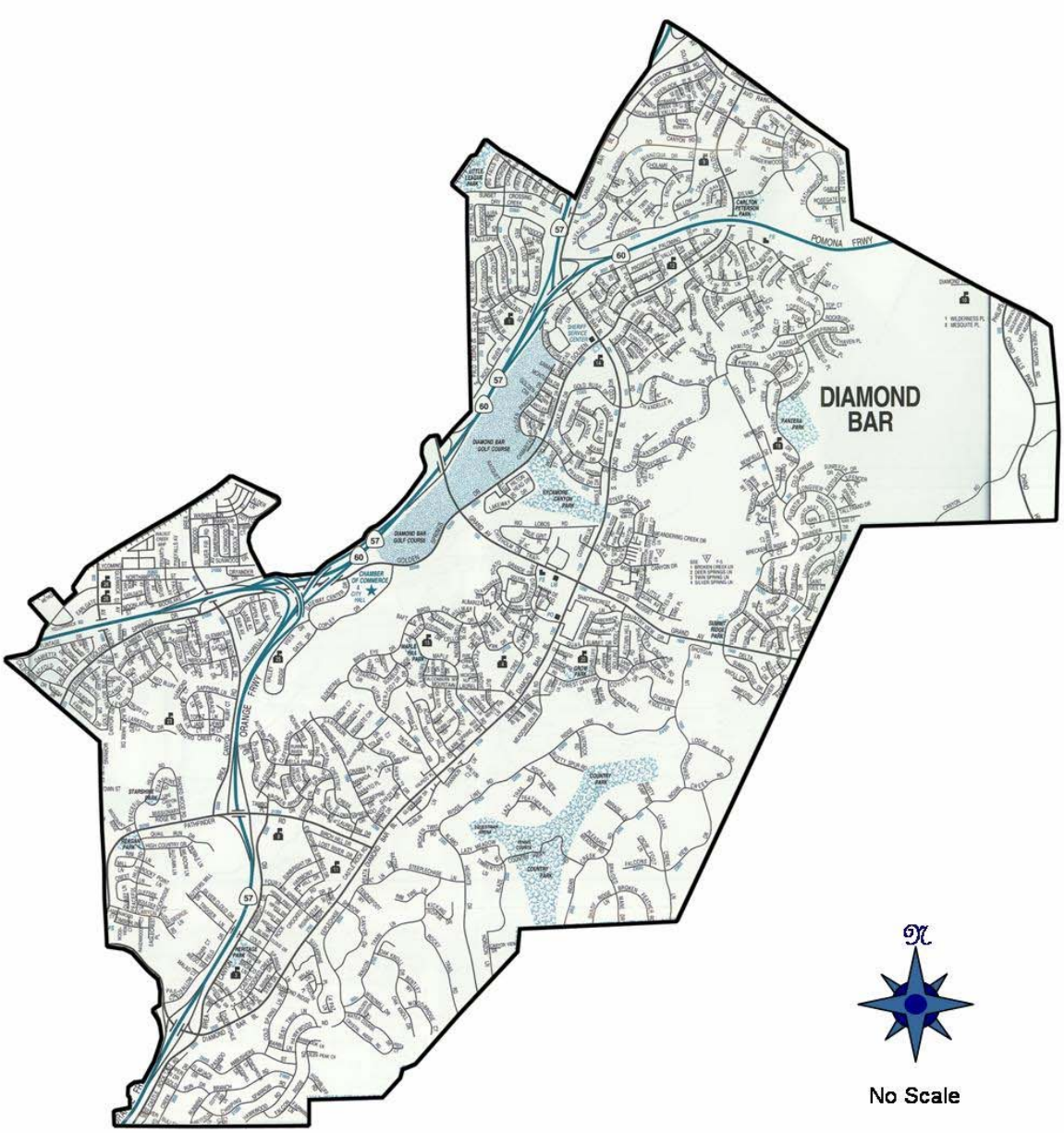
**Support for Natural Hazards Mitigation**

All mitigation is local, and the primary responsibility for development and implementation of risk reduction strategies and policies lies with local jurisdictions. Local jurisdictions, however, are not alone. Partners and resources exist at the regional, state and federal levels. Numerous California state agencies have a role in natural hazards and natural hazards mitigation. Some of the key agencies include:

- The Governor's Office of Emergency Services (OES) is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds after a major disaster declaration;

- The Southern California Earthquake Center (SCEC) gathers information about earthquakes, integrates this information on earthquake phenomena, and communicates this to end-users and the general public to increase earthquake awareness, reduce economic losses, and save lives.

- The California Division of Forestry (CDF) is responsible for all aspects of wildland fire protection on private, state land, and administers forest practices regulations, including landslide litigation, on non-federal lands.




No Scale

# Map 1
# City of Diamond Bar Base Map

Golf Course and Park Areas

- ❖ The California Division of Mines and Geology (DMG) is responsible for geologic hazard characterization, public education, the development of partnerships aimed at reducing risk, and exceptions (based on science-based refinement of tsunami inundation zone delineation) to state mandated tsunami zone restrictions; and

- ❖ The California Division of Water Resources (DWR) plans, designs, constructs, operates, and maintains the State Water Project; regulates dams; provides flood protection and assists in emergency management. It also educates the public and serves local water needs by providing technical assistance.

**Plan Methodology**

Information in the Mitigation Plan is based on research from a variety of sources. Staff from the City of Diamond Bar conducted data research and analysis, facilitated steering committee meetings and public workshops, and developed the final mitigation plan. The research methods and various contributions to the plan include:

**Input from the Planning Committee:**

The Natural Hazards Mitigation Planning Committee convened every 2 to 3 weeks (a total of 14 meetings) to guide development of the Mitigation Plan. The committee played an integral role in developing the mission, goals, and action items for the mitigation plan. The committee consisted of representatives of public and private agencies and organizations in City of Diamond Bar, including:

City of Diamond Bar Community and Development Services Department
City of Diamond Bar Administrative Services Department
City of Diamond Bar Building and Safety Division
City of Diamond Bar Finance Division
City of Diamond Bar Planning Division
City of Diamond Bar Public Information Division
City of Diamond Bar Public Works Division
City of Diamond Bar Community Services Division
Los Angeles County Sheriff's Department
Los Angeles County Fire Department

Local Agency Support:
Office of Disaster Management, Area D

Federal Emergency Management Agency
Southern California Association of Governments
Governor's Office of Emergency Services

American Red Cross
Pomona Unified School District
Walnut Valley Unified School District

**City Council Study Session meetings:**

City staff conducted two City Council Study Sessions/meetings with individuals and specialists from organizations interested in natural hazards planning. The interviews identified common concerns related to natural hazards and identified key long and short-term activities to reduce risk from natural hazards. A complete listing of all stakeholders is located in Appendix C. Stakeholders who attended and or whom were invited to attend the meetings for the plan included representatives from:

Water Providers
School District(s)
Los Angeles County Public Works
Los Angeles County Office of Emergency Management
Utility Providers
Local Businesses
City of Diamond Bar Chamber of Commerce
Diamond Bar Historical Society

**State and federal guidelines and requirements for mitigation plans:**

Following are the Federal requirements for approval of a Natural Hazards Mitigation Plan:

- Open public involvement, with public meetings that introduce the process and project requirements.
  The public must be afforded opportunities for involvement in: identifying and assessing risk, drafting a plan, and public involvement in approval stages of the plan.

- Community cooperation, with opportunity for other local government agencies, the business community, educational institutions, and non-profits to participate in the process.

- Incorporation of local documents, including the local General Plan, the Zoning Ordinance, the Building Codes, and other pertinent documents.

The following components must be part of the planning process:

- Complete documentation of the planning process.

- A detailed risk assessment on hazard exposures in the community.

- A comprehensive mitigation strategy, which describes the goals & objectives, including proposed strategies, programs & actions to avoid long-term vulnerabilities.

- A plan maintenance process, which describes the method and schedule of monitoring, evaluating and updating the Plan and integration of the Natural Hazards Mitigation Plan into other planning mechanisms.

- Formal adoption by the City Council.

- Plan Review by both State OES and FEMA.

These requirements are spelled out in greater detail in the following plan sections and supporting documentation.

A minimum of two public workshops (or other public forums) is recommended to meet the requirement for public participation, in addition to the inclusion of representatives from outside organizations on the planning committee itself. The timing and scheduling of the workshops may vary from one community to another depending on how each city's committee organizes its work and the particular needs of the community.

The City of Diamond Bar staff examined existing mitigation plans from around the country, current FEMA hazard mitigation planning standards and the State of California Natural Hazards Mitigation Plan Guidance.

Hazards specific research: The City of Diamond Bar staff collected data and compiled research on five hazards: earthquakes, earth movement, floods, wildfires and wind storms. Research materials came from state agencies including OES, and CDF. The City of Diamond Bar staff conducted research by referencing historical local newspapers, long time City of Diamond Bar employees and locating City of Diamond Bar information in historical documents.

The City of Diamond Bar staff identified current mitigation activities, resources and programs, and potential action items from research materials and stakeholder interviews.

**Public Meetings**

The City of Diamond Bar staff facilitated two public meetings to gather comments and ideas from City of Diamond Bar citizens about mitigation planning and priorities for mitigation plan goals. The first meeting, held May18, 2004, was held as a City Council Study Session as a part of the Regular City Council meeting. The Study Session was specifically related to the Local Natural Hazards Mitigation Plan. The second Public meeting/Study Session was held September 21, 2004.

The resources and information cited in the mitigation plan provide a strong local perspective and help identify strategies and activities to make City of Diamond Bar more disaster resilient.

**How Is the Plan Used?**

Each section of the mitigation plan provides information and resources to assist people in understanding the City and the hazard-related issues facing citizens, businesses, and the environment. Combined, the sections of the plan work together to create a document that guides the mission to reduce risk and prevent loss from future natural hazards events.

The structure of the plan enables people to use a section of interest to them. It also allows City government to review and update sections when new data becomes available. The ability to update individual sections of the mitigation plan places less of a financial burden on the City. Decision-makers can allocate funding and staff resources to selected pieces in need of review, thereby avoiding a full update, which can be costly and time-consuming. New data can be easily incorporated, resulting in a natural hazards mitigation plan that remains current and relevant to City of Diamond Bar.

The mitigation plan is organized in three volumes. Part I contains an executive summary, introduction, City profile, risk assessment, multi-hazard goals and action items and plan maintenance. Part II contains the five natural hazards sections and Part III includes the appendices. Each section of the Plan is described below.

- **Part I: Mitigation Action Plan**

**Executive Summary: Five-Year Action Plan**

The Five-Year Action Plan provides an overview of the mitigation plan mission, goals, and action items. The plan action items are included in this section, and address multi-hazard issues, as well as hazard-specific activities that can be implemented to reduce risk and prevent loss from future natural hazards events.

**Section 1: Introduction**
The Introduction describes the background and purpose of developing the mitigation plan for the City of Diamond Bar.

**Section 2: City Profile**
This section presents the history, geography, demographics, and socioeconomics of the City of Diamond Bar. It serves as a tool to provide an historical perspective of natural hazards in the City.

**Section 3: Risk Assessment**
This section provides information on hazard identification, vulnerability and risk associated with natural hazards in the City of Diamond Bar.

**Section 4: Multi-Hazard Goals and Action Items**
This section provides information on the process used to develop goals and action items that cut across the five natural hazards addressed in the mitigation plan.

**Section 5: Plan Maintenance**
This section provides information on plan implementation, monitoring and evaluation.

- **Part II: Hazard Specific Information**

Hazard-Specific Information on the five chronic hazards is addressed in this plan. Chronic hazards occur with some regularity and may be predicted through historic evidence and scientific methods. The chronic hazards addressed in the plan include:

**Section 6: Earthquake**

**Section 7: Earth Movement (Landslide / Debris Flow)**

**Section 8: Floods**

**Section 9: Wildfire**

**Section 10: Windstorm**

Catastrophic hazards do not occur with the frequency of chronic hazards, but can have devastating impacts on life, property, and the environment. In Southern California, because of the geology and terrain, earthquake, earth movement, floods and wildfire also have the potential to be catastrophic as well as chronic hazards.

Each of the hazard-specific sections includes information on the history, hazard causes and characteristics, hazard assessment, goals and action items, and local, state, and national resources.

- **Part III: Resources**

The plan appendices are designed to provide users of the City of Diamond Bar Natural Hazards Mitigation Plan with additional information to assist them in understanding the contents of the mitigation plan, and potential resources to assist them with implementation.

**Appendix A: Five-Year Action Plan Matrix**
This appendix includes the Fire-Year Action Plan which provides the implementation schedule for years 200-2009, outlines mitigation actions and associated goals and objectives, assigns a lead/responsible department and includes the requirement to update the NHMP every five years.

**Appendix B: Total Hazard Risk Rating Form**
This section has the Total Hazard Risk Rating form for the City of Diamond Bar and rates the Level of Risk associated with Magnitude, Duration, Distribution, Area Affected, Frequency, Probability, Degree of Vulnerability and Community Priority as well as Definitions for Hazard Prioritization.

**Appendix C: Public Participation Process**
This appendix includes specific information on the various public processes used during development of the plan.

**Appendix D: Benefit / Cost Analysis**
This section describes FEMA's requirements for benefit cost/analysis in natural hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities.

**Appendix E: Economic Analysis Guidelines**
This section outlines several approaches for conducting economic analysis of natural hazards mitigation projects.

**Appendix F: List of Acronyms**
This section provides a list of acronyms for City, regional, state, and federal agencies and organizations that may be referred to within the City of Diamond Bar Natural Hazards Mitigation Plan.

**Appendix G: Glossary**
This section provides a glossary of terms used throughout the plan.

## SECTION 2: CITY PROFILE

### Why Plan for Natural Hazards in City of Diamond Bar?

Natural hazards impact citizens, property, the environment, and the economy of the City of Diamond Bar. Earthquakes, earth movements, flooding, wildfires and wind storms have exposed City of Diamond Bar residents and businesses to the financial and emotional costs of recovering after natural disasters. The risk associated with natural hazards increases as more people move to areas affected by natural hazards.

Even in those communities that are essentially "built-out" i.e., have little or no vacant land remaining for development; population density continues to increase when low density housing is replaced with medium and high density development projects.

The inevitability of natural hazards, and the growing population and activity within the City create an urgent need to develop strategies, coordinate resources, and increase public awareness to reduce risk and prevent loss from future natural hazard events. Identifying the risks posed by natural hazards, and developing strategies to reduce the impact of a hazard event can assist in protecting life and property of citizens and communities. Local residents and businesses can work together with the City to create a natural hazards mitigation plan that addresses the potential impacts of hazard events.

### History

The City of Diamond Bar was once part of a huge cattle ranch known as "Rancho Nogales" which means "Ranch of the Walnut Trees". The land first became a ranch during Spanish colonial period and prospered until the 1860's when drought caused the failure of many local ranches. One of the owners of the ranch, Ricardo Vejar, was considered one of the most powerful cattle ranchers in the country. The land was divided and recombined several times through the 1950's. In 1956, the land that is present day Diamond Bar was bought by the Christiana Oil Corporation and the Capital Company, which was later purchased by TransAmerica.

In 1956, Diamond Bar Ranch looked much as it did in 1840, with its golden hills peppered by green stands of oak and walnut trees and grazed by large herds of cattle. TransAmerica Corporation, which purchased 8,000 acres of Brea Canyon, soon mapped out a master-planned community that today has become home to more than 58,000 residents.

Diamond Bar was one of the first planned communities, preceding even the well-known City of Irvine in nearby Orange County. The housing and non-residential uses that occupy the City at present have all been built since the master plan was adopted in the 1950's. In 1983, local residents almost voted to incorporate as a City, falling just short of the needed number of votes. In 1988, residents launched a second, and this time successful, bid for incorporation. On April 18$^{th}$, 1989, Diamond Bar became the 86$^{th}$ city of Los Angeles County.

### Land Use

Land uses within the City are primarily residential, with supporting commercial (retail), office and professional and public serving uses. There are no heavy industrial or manufacturing uses within the City, although there are various business parks and office uses. Diamond Bar is generally

characterized by single-family dwellings, rolling hillsides and a rural lifestyle. It is largely developed, yet there continues to be development potential in the open space areas within valleys and canyons which still exist and many walnut and oak tress have been preserved. A large, gate-guarded community occupies 1,250 acres along the eastern boundary of the City called "The Country."

**Location**

**Regional Location**: Diamond Bar is located in southeastern Los Angeles County, adjacent to the western border of San Bernardino County and the northern border of Orange County. The City is bordered on the west by the cities of Walnut and Industry, on the north by the City of Pomona, on the east by unincorporated San Bernardino County land and on the south by City of Chino Hills and unincorporated Los Angeles County land (Tonner Canyon). Further south lays the City of Brea in neighboring Orange County. Diamond Bar is approximately 20 miles east of downtown Los Angeles, 30 miles north of Santa Ana, and 30 miles west of downtown San Bernardino.

**Local Vicinity**: Diamond Bar is located at the intersection of the Pomona Freeway (SR 60) (east-west) and Orange freeway (SR57) (north-south) (Map 2 – Regional Location). It is situated among the rolling Puente and Chino Hills. Diamond Bar occupies land on both sides of the 57 Freeway (in the vicinity of Brea Canyon Road cutoff to the south, and Temple Avenue to the north), and in the south of the 60 Freeway (between Fairway and the 57 Freeway intersection). Small sections of the City are north of the 60 Freeway, near Brea Canyon Road and Sunset Crossing Road.

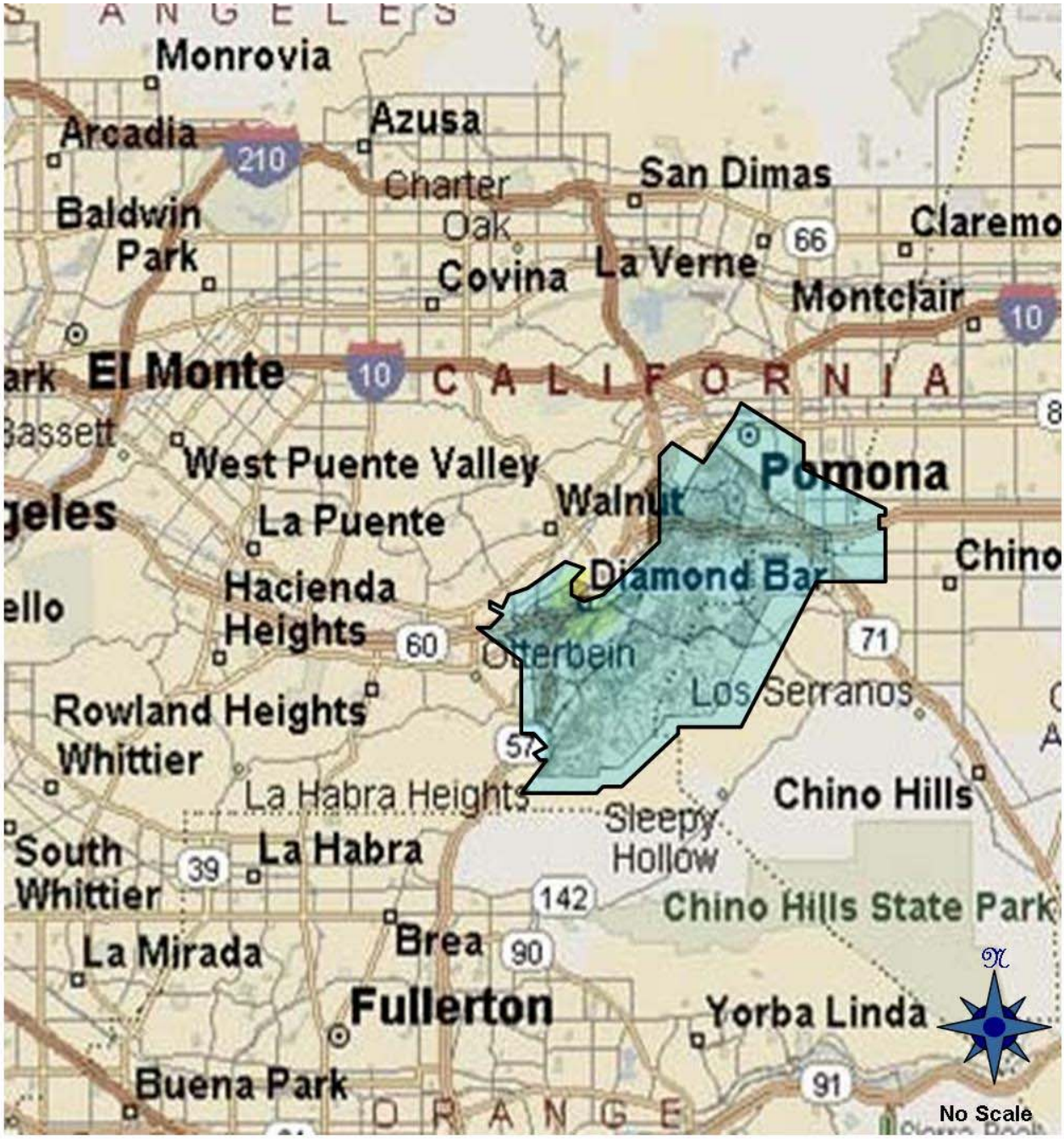
The City of Chino Hills is directly east of Diamond Bar in San Bernardino County. Phillips Ranch, a master planned community and other rural residential uses are located to the north. Industrial land uses and the Union Pacific Railroad lie northwest of the City, while residential uses are located to the west in the City of Walnut and the community of Rowland Heights.

**Sphere of Influence**

The City's Sphere of Influence, as approved by the Los Angeles County Local Agency Formation Commission, encompasses 3,591 acres (5.6 square miles) immediately south of the City limits to the Los Angeles/Orange County line. The area includes the middle portion of the pristine Tonner Canyon.

**Geography and the Environment**

The City limits comprise 9,583 acres or 14.9 square miles. Elevations within the City range from 500 feet at the southwest corner of the City to over 1,470 feet along the eastern ridgelines.




# Map 2
# Regional Map

LEGEND

City of Diamond Bar

**Table 2-1: Statistical Profile**

As of January 2002

| | |
|---|---|
| Demographics | |
| Population | 59,487 |
| Median Age | 36 years |
| Total number of households | 18,029 |
| Average household size | 3.18 |
| Median Household Income | $101,164 |
| Median Property Value (owner occupied) | $315,862 |
| Homeowner vacancy rate | 0.7% |
| Rental vacancy rate | 1.9% |
| Total Employment | 30,730 |
| School Enrollment (2000) | 13,563 |
| Assessed Valuation | $4.293 billion |
| Taxable Sales (2000) | $274 million |
| **Land Use Mix** | |
| Area | 14.9 sq. miles |
| Industrial | 0.9 percent |
| Retail/Office/Commercial | 3.3 percent |
| Residential | 54.6 percent |
| Parks/Public Facilities | 19.0 percent |
| Vacant | 22.2 percent |
| **Transportation** | |
| Accessible Freeways | Orange (57) and Pomona (60) |
| Rail and Bus Service | Metrolink, Foothill Transit and MTA |
| Airports | Ontario International (25 miles) |
| | Los Angeles International (48 miles) |
| | John Wayne (30 miles) |

**Educational Facilities**
There are nine elementary school, three middle schools, two high schools, and a Public Library located in Diamond Bar.

**Recreational Facilities**
The City has ten parks, a Public golf course, a Little League Sports Complex, and a Community Center.

**Major River**
The nearest major river is the San Gabriel River. This river does not have any potential impact on the City of Diamond Bar as it is located at least 12 miles away.

**Climate**
Temperatures in the City of Diamond Bar range from a monthly average low of 54.833 degrees and a monthly average high of 77.083 to above 90 degrees in the summer months. However the temperatures can vary over a wide range, particularly when the Santa Ana winds blow, bringing higher temperatures and very low humidity

Rainfall in the City averages 10.84 inches of rain per year. However the term "average rainfall" is misleading because over the recorded history of rain fall in the City of Diamond Bar rainfall amounts have ranged from no rain at all in some years to over 20 inches of rain in rare, very wet years.

Furthermore actual rainfall in Southern California tends to fall in large amounts during sporadic and often heavy storms rather than consistently over storms at somewhat regular intervals. In short rainfall in Southern California might be characterized as feast or famine within a single year. Because the metropolitan basin is largely built out, water originating in higher elevation communities can have a sudden impact on adjoining communities that have a lower elevation.

**Minerals and Soils**
The characteristics of the minerals and soils present in the City of Diamond Bar indicate the potential types of hazards that may occur. Rock hardness and soil characteristics can determine whether or not an area will be prone to geologic hazards such as earthquakes, liquefaction and landslides.

**Local Soils:**
Local soils are derived primarily from erosion of the surrounding uplands, producing a variety of soil types. Three local members of the underlying Puente Formation are comprised of various siltstones and sandstones containing calcium, silica and mica. These materials are weakly bedded and their erosion contributes to the formation of the major soil groups found in the Diamond Bar area. While many hillside areas contain little or no topsoil cover, local soils fall into two broad classes: uplands and alluvial valleys, fans and terraces.

Understanding the geologic characteristics of the City of Diamond Bar is an important step in hazard mitigation and avoiding at-risk development.

**Other Significant Geologic Features**
The City of Diamond Bar, like most of the Los Angeles Basin, lie over the area of one or more known earthquake faults, and potentially many more unknown faults, particularly so-called lateral or blind thrust faults.

The major faults that have the potential to affect the greater Los Angeles Basin, and therefore the City of Diamond Bar are the: San Andreas, Newport Inglewood, Palos Verdes, Whittier and Santa Monica faults. The locations of these faults are a significant distance from Diamond Bar.

The entire Southern California region is seismically active and contains a number of major active faults. The San Andreas Fault Zone, located 26 miles northwest of the City, is considered to have the greatest potential to cause regional damage. However, it has been estimated that four potentially active local faults (Whittier, San Jose, Sierra Madre and San Gabriel) have a higher potential for causing local damage. Several major faults are located adjacent to the City. The Whittier Fault Zone passes just south of Tonner Canyon, the City's sphere of influence, while the

Chino Fault passes within a mile of the City's eastern boundary. In addition, there are three small inactive local faults within Diamond Bar. A small inactive fault also passes through Tonner Canyon in the City's sphere of influence.

The Los Angeles Basin has a history of powerful and relatively frequent earthquakes, dating back to the powerful 8.0+ San Andreas earthquake of 1857 which did substantial damage to the relatively few buildings that existed at the time. Paleoseismological research indicates that large (8.0+) earthquakes occur on the San Andreas fault at intervals between 45 and 332 years with an average interval of 140 years[1]. Other lesser faults have also caused very damaging earthquakes since 1857. Notable earthquakes include the Long Beach earthquake of 1933, the San Fernando earthquake of 1971, the Whittier earthquake of 1987 and the Northridge earthquake of 1994.

In addition, many areas in the Los Angeles Basin have sandy soils that are subject to liquefaction.

**Liquefaction**

The greatest danger from liquefaction occurs in areas where the ground water table is within thirty five (35) feet of ground level and the soil is poorly consolidated or relatively uncompacted. This condition is characterized by the sudden loss of shearing resistance due to ground shaking combined with an increase in pore water pressure. Subsequently, this will often result in the collapse or displacement of building foundations. Identification of liquefaction zones is based primarily on the occurrence of groundwater in surficial alluvial deposits. Water in the east San Gabriel Valley is generally found at depths of 30 to 200 feet at present, although the Los Angeles County General Plan did identify areas along the San Jose Creek, adjacent to the City, as having groundwater within 30 feet of the surface (LACDRP 1988). Areas of high groundwater have also been previously documented within Diamond Bar (LACDRP 1982 p. 35). The EIR for the Community Plan prepared in 1982 indicated that water levels as high as 14 to 35 feet below the ground surface have occurred in Diamond Bar. These low points have historically been near Brea, Diamond Bar and Tonner Canyons.

The regional water table is probably lower than historic levels, due to the overuse of groundwater in the East San Gabriel Valley. However, the potential for minor liquefaction may still exist along the some stream channels in Diamond Bar.

**Landslides**

Most of the hillsides in Diamond Bar have moderate potential for landslides. The stability of a slope is attributed to such factors as the soil type, gradient of the slope (greater that 25 percent particularly underlying geologic structure and local drainage patterns. The rolling topography and composition of local soils throughout most of the City create numerous areas for potential landslide hazards. Although many historic landslide locations have since been stabilized through proper grading and development, there still exist a number of potential landslide areas along the eastern third of the City as well as in Tonner Canyon (sphere of influence).

[1] Peacock, Simon M., http://aamc.geo.lsa.umich.edu/eduQuakes/EQpredLab/EQprediction.peacock.html

**Population and Demographics**
The City of Diamond Bar has a population of about 59,487 in an area of 14.9 square miles, according to the State of California, Department of Finance, *E-1 City/County Population Estimates, with Annual Percent Change, January 1, 2003 and 2004, Sacramento, CA., May 2004.* The population of the City of Diamond Bar has steadily increased from the mid 1800's through 2000, and increased 10.1% from 1990 to 2001 according to the 2000 Census.

The increase of people living in the City of Diamond Bar creates more community exposure, and changes how agencies prepare for and respond to natural hazards. For example, more people living on the urban fringe can increase risk of fire. Wildfire has an increased chance of starting due to human activities in the urban/rural interface, and has the potential to injure more people and cause more property damage. But an urban/wildland fire is not the only exposure to the City of Diamond Bar. In the 1987 publication, Fire Following Earthquake issued by the All Industry Research Advisory Council, Charles Scawthorn explains how a post-earthquake urban conflagration would develop. The conflagration would be started by fires resulting from earthquake damage, but made much worse by the loss of pressure in the fire mains, caused by either lack of electricity to power water pumps, and /or loss of water pressure resulting from broken fire mains.

Furthermore, increased density can affect risk. For example, narrower streets are more difficult for emergency service vehicles to navigate, the higher ratio of residents to emergency responders affects response times, and homes located closer together increase the chances of fires spreading.

The City of Diamond Bar is experiencing a great deal of in-fill building, which is increasing the population density creating greater service loads on the built infrastructure, including roads, water supply, sewer services and storm drains.

Natural hazards do not discriminate, but the impacts in terms of vulnerability and the ability to recover vary greatly among the population. According to the Federal Emergency Management Agency (FEMA) Preparedness, 80% of the disaster burden falls on the public, and within that number, a disproportionate burden is placed upon special needs groups: women, children, minorities, and the poor.[2]

According the latest census figures, (2000) the demographic make up of the city is as follows:

Table 2-2 Race and Ethnic Composition of Diamond Bar (2000)

| | | | |
|---|---|---|---|
| Asian: | | 24,066 | 42.8% |
| Asian Indian | 2,253 | | |
| Chinese | 10,091 | | |
| Filipino | 3,010 | | |
| Japanese | 955 | | |
| Korean | 5,580 | | |
| Vietnamese | 626 | | |
| Other Asian | 1,551 | | |
| Caucasian | | 23,103 | 41% |

[2] www.fema.gov

| | | | |
|---|---|---|---|
| Hispanic or Latino (or any race) | 10,393 | | |
| African American | | 2,680 | 4.8% |
| Native American and Alaskan Native | | 185 | 0.3% |
| Native Hawaiian and Other Pacific Islander: | | 67 | 0.1% |
| Other | | 3,818 | 6.8% |
| Two or more races | | 2,368 | 4.2% |
| Total | | 56,287 | 100% |

Vulnerable populations, including seniors, disabled citizens, women, and children, as well as those people living in poverty, may be disproportionately impacted by natural hazards.

Examining the reach of hazard mitigation policies to special needs populations may assist in increasing access to services and programs. FEMA's Office of Equal Rights addresses this need by suggesting that agencies and organizations planning for natural disasters identify special needs populations, make recovery centers more accessible, and review practices and procedures to remedy any discrimination in relief application or assistance.

The cost of natural hazards recovery can place an unequal financial responsibility on the general population when only a small proportion may benefit from governmental funds used to rebuild private structures. Discussions about natural hazards that include local citizen groups, insurance companies, and other public and private sector organizations can help ensure that all members of the population are a part of the decision-making processes.

**Land and Development**

Development in Southern California from the earliest days was a cycle of boom and bust. The Second World War however dramatically changed that cycle. Military personnel and defense workers came to Southern California to fill the logistical needs created by the war effort. The available housing was rapidly exhausted and existing commercial centers proved inadequate for the influx of people. Immediately after the war, construction began on the freeway system, and the face of Southern California was forever changed. Home developments and shopping centers sprung up everywhere and within a few decades the central basin of Los Angeles County was virtually built out. This pushed new development further and further away from the urban center.

The City of Diamond Bar General Plan addresses the use and development of private land, including residential and commercial areas. This plan is one of the City's most important tools in addressing environmental challenges including transportation and air quality; growth management; conservation of natural resources; clean water and open spaces

The environment of most Los Angeles County cities is nearly identical with that of their immediate neighbors and the transition from one incorporated municipality to another is seamless to most people. Seamless too are the exposures to the natural hazards that affect all of Southern California.

**Housing and Community Development**

In the City of Diamond Bar and Southern California, the demand for housing outstrips the available supply, and the recent low interest rates have further fueled a pent up demand.

Single-family homes account for 85% or the nearly 18,000 total units in the community. Multifamily units including condominiums and apartments constitute 13% of the housing stock. Two mobile home parks comprise the remaining 2% of housing stock. In 1990, the median price single-family home was at approximately $253,000 and the median price for condominiums was at approximately $100-129,000. The average value for homes in the City of Diamond Bar in 2004 is estimated at $560,741 and for condo/townhouse/co-op is $270,704.

| Single Family Home | | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|
| Median Price | $ | 354,591 | 519,277 | 433,428 | 560,741 |
| Highest Price Paid | $ | 9,999,999 | 1,820,000 | 2,300,000 | 2,418,000 |
| Lowest Price Paid | $ | 139,000 | 197,000 | 196,000 | 352,500 |
| | | | | | |
| Condo/Townhouse/Co-Op | | | | | |
| Median Price | $ | 144,136 | 172,685 | 213,692 | 270,704 |

The City participates in the Community Development Block Grant (CDBG) program. The primary resource available to address non-housing community development needs is the CDBG. City of Diamond Bar's CDBG allocation for the year 2004 will be $435,885.

Subtle but very measurable changes occur constantly in communities that increase the potential loss that will occur in a major disaster. There are number of factors that contribute to this increasing loss potential. First, populations continue to increase, putting more people at risk within a defined geographic space. Second, inflation constantly increases the worth of real property and permanent improvements. Third, the amount of property owned per capita increases over time. Information from the U.S. Census Bureau shows gains in average housing standards.

Table 2-3: Property Owned Per Capita

| Amount of Property per person | 1975 | 1998 |
|---|---|---|
| Increased Size of new homes | 1645 sq. ft. | 2190 sq. ft. |
| % of homes with 4 + bedrooms | 21% | 33% |
| % of homes with 2 ½ or more baths | 20% | 52% |
| Source: U.S. Department of Census | | |

**Earthquake Damage/Population Growth**

If we look at the greatest recorded earthquakes in American history, and compare the level of population and development today with that which existed at the time of the event, the scale of potential damage is staggering.

Table 2-4: Earthquake Damage/Population Growth

| | |
|---|---|
| 1886 Charleston Earthquake | Magnitude 7.3 in Charleston, SC |
| Estimated insured damage if happened today $10 Billion | |
| 1906 San Francisco Earthquake | Magnitude 8.3 |
| Significant fire following damage | |
| Estimated insured damage if happened today $36 Billion | |
| 1811-12 New Madrid Earthquake | Series of 4 Earthquakes over 7 weeks |
| Estimated insured damage if happened today $88 Billion | |

Source: Risk Management Solutions

**Employment and Industry**

Service industries, retail trade, finance/insurance/real estate and commerce are the City of Diamond Bar's principal employment and industrial activities. Service employment accounted for the largest percentage (44.9%), followed by trade-related industries (17.9%) finance, insurance, and real estate (12.9%) and manufacturing (4.9%).

The City also had significant employment in construction (5.9%); and transportation, communications, and utilities (3.7%) and government (0.7%).

Business Types

- Services: 44.9 percent
- Retail Trade: 17.1 percent
- Finance/Insurance/Real Estate 12.9 percent
- Wholesale Trade 9.0 percent
- Construction 5.9 percent
- Manufacturing 4.9 percent
- Transportation/Community & Public Utilities 3.7 percent
- Agriculture 1.0 percent
- Government 0.7 percent

**Top Employers**

Rated one of the top business locations in California, Diamond Bar is conveniently located at the center of Los Angeles, Orange and San Bernardino counties.

Top Employers:

- South Coast Air Quality Management District (AQMD)
- Allstate Insurance
- Travelers Insurance
- Walnut Valley Unified School District
- Pomona Unified School District
- South Coast Cabinets
- Acosta

Mitigation activities are needed at the business level to ensure the safety and welfare of workers and limit damage to industrial infrastructure. Employees are highly mobile, commuting from surrounding areas to industrial and business centers. This creates a greater dependency on roads, communications, accessibility and emergency plans to reunite people with their families. Before a

natural hazard event, large and small businesses can develop strategies to prepare for natural hazards, respond efficiently, and prevent loss of life and property.

**Transportation and Commuting Patterns**

The City of Diamond Bar is the 33rd largest City in the Los Angeles Metropolitan Statistical Area (LAMSA). Over the past decade, the LAMSA experienced rapid growth in employment and population. Private automobiles are the dominant means of transportation in Southern California and in the City of Diamond Bar.

However, the City of Diamond Bar meets its public transportation needs through a mixture of a regional transit system. MTA provides both bus and light rail service to the City of Diamond Bar and to the Los Angeles County metropolitan area. There is a Metrolink Rail Station in the adjacent City of Industry. In addition to this service, the City promotes alternative transportation activities such as Bicycle routes and trails. Source: City-wide Comprehensive Trials Plan/Recreation Trails and Bicycle Routes Master Plan.

The City of Diamond Bar is served by the 57 and 60 Freeways, connecting the City to adjoining parts of Los Angeles, Orange and San Bernardino Counties. The City's 135 mile road system includes 30 miles of arterial highways and 105 miles of local roads, and 16 bridges.

Localized flooding can render roads unusable. A severe winter storm has the potential to disrupt the daily driving routine of hundreds of thousands of people. Natural hazards can disrupt automobile traffic and shut down local and regional transit systems.

**Diamond Bar Historic Natural Disasters**

The City of Diamond Bar has not, fortunately, had any recent or for that matter, any historic major natural disasters. The relative “newness” of the city (1989 incorporation) contributes to its safety. The outstanding efforts of the Los Angeles County Sheriff’s and Fire Departments and city staff can be credited also.

The fact that most residential and commercial buildings in Diamond Bar are post 1960-70 construction is another positive as it relates to hazard vulnerability, in particular as it relates to earthquakes. The City has no unreinforced masonry buildings, no hazardous materials sites and is not threatened by any major rivers or dams. These fortunate circumstances and staff work contribute toward Diamond Bar being a “relatively” safe city.

## SECTION 3: RISK ASSESSMENT

Conducting a risk assessment can provide information: on the location of hazards, the value of existing land and property in hazard locations, and an analysis of risk to life, property, and the environment that may result from natural hazard events. Specifically, the three levels of a risk assessment are as follows:

### Hazard Identification

This is the description of the geographic extent, potential intensity and the probability of occurrence of a given hazard. Maps are frequently used to display hazard identification data. The City of Diamond Bar identified six major hazards that affect this geographic area. These hazards - earthquakes, earth movement, floods, wildfires, wind storms, and drought - were identified through an extensive process that utilized input from the Natural Hazards Mitigation Planning Committee. The geographic extent of each of the identified hazards has been identified by using the best available data, and is illustrated by the charts/maps listed in this document.

### Profiling Hazard Events

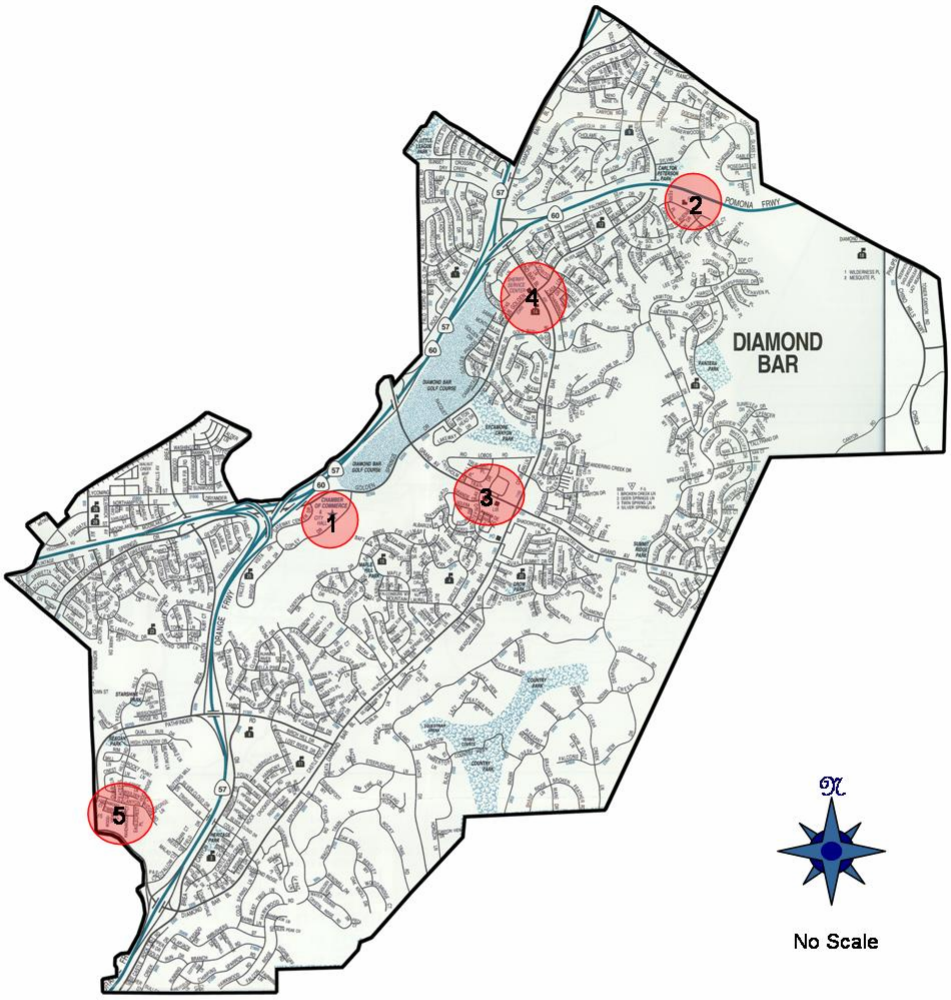
This process describes the causes and characteristics of each hazard, how it has affected City of Diamond Bar in the past, and what part of the City of Diamond Bar's population, infrastructure, and environment has historically been vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in each hazard section. For a full description of the history of hazard specific events, please see the appropriate hazard chapter.

### Vulnerability Assessment/Inventorying Assets

This is a combination of hazard identification with an inventory of the existing (or planned) property development(s) and population(s) exposed to a hazard. Critical facilities are of particular concern because these entities provide essential products and services to the general public that are necessary to preserve the welfare and quality of life in the City and fulfill important public safety, emergency response, and/or disaster recovery functions. The critical facilities have been identified and are illustrated in the Critical Facilities Map (Map 3). A description of the critical facilities in the City is also provided in this section. In addition, this plan includes a community issues summary in each hazard section to identify the most vulnerable and problematic areas in the City, including critical facilities, and other public and private property.

### Risk Analysis

Estimating potential losses involves assessing the damage, injuries, and financial costs likely to be sustained in a geographic area over a given period of time. This level of analysis involves using mathematical models. The two measurable components of risk analysis are magnitude of the harm that may result and the likelihood of the harm occurring. Describing vulnerability in terms of dollar losses provides the community and the state with a common framework in which to measure the effects of hazards on assets. Please see Appendix A to review the Total Hazard Risk Rating Form.




# Map 3
# Critical Facilities Map

LEGEND

Golf Course and Park Areas

Critical Facilities

1- City Hall
2- Fire Station 119
3- Fire Station 120
4- Sheriff's Sub-Station
5- Fire Station 121

## Assessing Vulnerability/ Analyzing Development Trends

This step provides a general description of land uses and development trends within the community so that mitigation options can be considered in land use planning and future land use decisions. This plan provides a comprehensive description of the character of City of Diamond Bar in the Community Profile. This description includes the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns. Analyzing these components of the City of Diamond Bar can help in identifying potential problem areas and can serve as a guide for incorporating the goals and ideas contained in this mitigation plan into other community development plans.

Note: The information on the maps in this plan was derived from the City of Diamond Bar's staff. Care was taken in the creation of these maps, but is provided "as is." The City of Diamond Bar cannot accept any responsibility for any errors, omissions or positional accuracy, and therefore, there are no warranties that accompany these products (the maps). Although information from land surveys may have been used in the creation of these products, in no way does this product represent or constitute a land survey. Users are cautioned to field verify information on this product before making any decisions.

Hazard assessments are subject to the availability of hazard-specific data. Gathering data for a hazard assessment requires a commitment of resources on the part of participating organizations and agencies. Each hazard-specific section of the plan includes a section on hazard identification using data and information from City, County or State agency sources.

Regardless of the data available for hazard assessments, there are numerous strategies the City can take to reduce risk. These strategies are described in the action items detailed in each hazard section of this Plan. Mitigation strategies can further reduce disruption to critical services, reduce the risk to human life, and alleviate damage to personal and public property and infrastructure. Action items throughout the hazard sections provide recommendations to collect further data to map hazard locations and conduct hazard assessments.

## Federal Requirements for Risk Assessment

Recent federal regulations for hazard mitigation plans outlined in 44 CFR Part 201 include a requirement for risk assessment. This risk assessment requirement is intended to provide information that will help communities to identify and prioritize mitigation activities that will reduce losses from the identified hazards. There are five hazards profiled in the mitigation plan, including earthquakes, earth movements, flooding, wildfires and wind storms. The Federal criteria for risk assessment and information on how the City of Diamond Bar Natural Hazards Mitigation Plan meets those criteria are outlined in Table 3-1 below.

**Table 3-1: Federal Criteria for Risk Assessment**

| Section 322 Plan Requirement | How is this addressed? |
|---|---|
| Identifying Hazards | Each hazard section includes an inventory of the best available data sources that identify hazard areas. To the extent data are available, the City developed maps identifying the location of the hazard in the City. The index of the plan includes a list of the hazard maps. |
| Profiling Hazard Events | Each hazard section includes documentation of the history, and causes and characteristics of the hazard in the City. |
| Assessing Vulnerability: Identifying Assets | Where data is available, the vulnerability assessment for each hazard addressed in the mitigation plan includes an inventory of all publicly owned land within hazardous areas. Each hazard section provides information on vulnerable areas in the City in the Community Issues section. Each hazard section also identifies potential mitigation strategies. |
| Assessing Vulnerability: Estimating Potential Losses: | The Risk Assessment Section of this mitigation plan identifies key critical facilities and lifelines in the City and includes a map of these facilities. Vulnerability assessments have been completed for the hazards addressed in the plan, and quantitative estimates were made for each hazard where data was available. |
| Assessing Vulnerability: Analyzing Development Trends | The City of Diamond Bar Profile Section of this plan provides a description of the development trends in the City, including the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns. |

**Critical Facilities, Essential Facilities and Infrastructure**

Facilities critical to government response and recovery activities (i.e., life safety and property and environmental protection) include: 911 centers, emergency operations centers, police and fire stations, public works facilities, communications centers, sewer and water facilities, hospitals, bridges and roads, and shelters, facilities that, if damaged, could cause serious secondary impacts may also be considered "critical." A hazardous material facility is one example of this type of critical facility. See page 31, Critical Facilities Map 3.

Critical and essential facilities are those facilities that are vital to the continued delivery of key government services or that may significantly impact the public's ability to recover from the emergency. These facilities may include: City Hall, parks, fire and sheriff stations and schools. These are listed in the following pages (Diamond Bar Sites and Critical Facilities List). The following pages also illustrate Essential Facilities (Map 4, Page 39), Infrastructure Facilities (Map 5, Page 40) and Hazardous Material Sites (Map 6, Page 41).

## DIAMOND BAR SITES AND CRITICAL/ESSENTIAL FACILITIES LIST

All Telephone Numbers are Area Code 909 unless otherwise noted. Some facilities listed are not critical in nature, may be outside the City of Diamond Bar, are within the sphere of influence and are listed for informational purposes only. Some of the agencies listed are responsible for preparing their own Natural Hazards Mitigation Plan.

CITY HALL

| | |
|---|---|
| Address: | 21825 Copley Drive<br>Diamond Bar, CA 91765-4178 |
| Telephone/Fax: | 839-7000 |
| Fax: | 861-3117 |
| Email address: | info@ci.diamond-bar.com |

DIAMOND BAR CENTER

| | |
|---|---|
| Address: | 1600 S. Grand Avenue<br>Diamond Bar, CA 91765 |
| Telephone/Fax: | 839-7070 |
| Fax: | 612-4580 |
| Email address: | info@ci.diamond-bar.ca.us |

PARKS

| | |
|---|---|
| Heritage Park | 2900 S. Brea Canyon Road<br>Community Center |
| Larkstone Park | Larkstone Drive |
| Maple Hill Park | 1309 S. Maple Hill Road |
| Pantera Park | 738 Pantera Drive |
| Paul C. Grow Park | 23281 E. Forest Canyon Drive |
| Peterson Park | 24142 E. Sylvan Glen Drive |
| Ronald Reagan Park | 2201 S. Peaceful Hills Road |
| Starshine Park | 20839 Starshine Road |
| Summitridge Park | 1426 Summitridge Drive |
| Sycamore Canyon Park | 22930 Golden Springs Road, 396-0194 |

FIRE STATIONS – Los Angeles County Fire Department

| | |
|---|---|
| Station #119 | 20480 Pathfinder |
| Telephone: | 598-4290 |
| Station #120 | 1051 S. Grand |
| Telephone: | 861-5995 |
| Station #121 | 346 Armitos |
| Telephone: | 396-0164 |

POLICE – Los Angeles County Sheriff's Department

| | |
|---|---|
| City of Diamond Bar Public Safety | 21825 Copley Drive<br>839-7040 |
| Walnut/Diamond Bar Sheriff's Station | 21695 E. Valley Blvd., Walnut<br>595-2264 |

SCHOOLS

| | |
|---|---|
| Pomona Unified School District | 397-4800 |
| Diamond Ranch High School | 100 Diamond Ranch, Pomona |
| Telephone: | 397-4715 |
| Lorbeer Middle School | 501 Diamond Bar Blvd. |
| Telephone: | 397-4527 |
| Armstrong Elementary | 22750 Beaverhead Drive |
| Telephone: | 397-4563 |
| Diamond Point Elementary | 24150 Sunset Crossing Road |
| Telephone: | 397-4587 |
| Golden Springs Elementary | 245 S. Ballena Drive |
| Telephone: | 397-4596 |
| Pantera Elementary | 801 Pantera Drive |
| Telephone: | 397-4475 |

Walnut Valley Unified School District

| | |
|---|---|
| School District Admin. Offices | 880 South Lemon Avenue |
| Telephone: | 595-1261 |
| Diamond Bar High School | 21400 Pathfinder Road |
| Telephone: | 594-1405 |
| Chaparral Middle School | 1405 S. Spruce Tree |
| Telephone: | 861-6227 |
| South Pointe Middle School | 20671 E. Larkstone Drive |
| Telephone: | 595-8171 |
| Castle Rock Elementary | 2975 Castle Rock Road |
| Telephone: | 598-5006 |
| Evergreen Elementary | 2450 S. Evergreen Springs Drive |
| Telephone: | 594-1041 |
| Maple Hill Elementary | 1350 S. Maple Hill Road |
| Telephone: | 861-6224 |
| Quail Summit Elementary | 23330 Quail Summit |
| Telephone: | 861-3004 |
| Walnut Elementary | 841 Glenwick Avenue |
| Telephone: | 594-1820 |

Private Schools

| | |
|---|---|
| University of Phoenix | 1370 S. Valley Vista Drive<br>(800) 888-1968 |
| Mount Calvary Lutheran School | 23300 Golden Springs Drive<br>861-2740 |

Day Care Centers

| | |
|---|---|
| Village Montessori Academy | 23431 Golden Springs |
| Diamond Bar Montessori Academy | 23555 Palomino |
| Cumorah Jr. Academy | 3201 S. Brea Canyon Road |
| Le Petite Academy | 21385 Cold Spring Lane |
| Le Petite Academy | 722 S. Grand |
| Diamond Canyon Christian | 3338 Diamond Canyon Road |
| Discovery World | 801 S. Brea Canyon Drive |

| | |
|---|---|
| Bridgegate | 1400 Bridgegate |
| SCAQMD Child Care Center | 21865 Copley Drive, 396-2000 |
| YMCA | 22600 Sunset Crossing Rd., 860-9622 |

Senior Care

| | |
|---|---|
| Well & Fit Adult Day Care Center | 23401 Golden Springs |
| Seasons Senior Apartments | 23750 Highland Valley Road<br>860-6696 |

Shopping Centers

| | |
|---|---|
| Kmart Shopping Center | 200 Block Diamond Bar Blvd. |
| Vons/Sav-On Shopping Center | 200-300 Block Diamond Bar Blvd. |
| Country Hills Towne Center | Diamond Bar Blvd. & Fountain Springs |
| World Market | Golden Springs & Brea Canyon Road |
| Ralph's/Albertson's | S. Diamond Bar Blvd. |

Hospital/Medical Clinics

| | |
|---|---|
| St. Jude Medical Clinic | 15114 Valley Vista Drive |
| Medical Clinics at | 1801 S. Grand<br>1201 S. Grand<br>1241 S. Grand |
| Brea Community Hospital | 380 W. Central Ave. Brea<br>(714) 529-0211 |
| Pomona Valley Hospital | 1798 N. Garey Avenue, Pomona<br>865-9500 |
| St. Jude Hospital | 101 East Valencia Mesa Drive, Fullerton<br>(714) 871-3280 |
| San Dimas Hospital | 1350 W. Covina Blvd., Covina<br>599-6811 |
| Citrus Valley Medical Center | 210 W. Bernardino Rd., Covina<br>(626) 331-7331 |
| Lanterman Development Center | 3530 W. Pomona Blvd., Pomona<br>595-1221 |

Hotels

| | |
|---|---|
| Holiday Inn Select | 21725 Gateway Center Drive |
| Ayres Suites | 21951 Golden Springs Road |
| Best Western | 259 Gentle Springs Lane |

Utilities

| | |
|---|---|
| Edison | (800)611-1911 |
| Sub-Station 1139 S. Diamond Bar Blvd. (behind Big Lots) | |
| Verizon (Phone Company) | (800)483-5000 |
| Switching Station – Grand/Montefino | |
| Gas Company | (800)427-2200 |
| Adelphia Cable | 594-2729 |
| Walnut Valley Water | 595-7554 |

Water Tanks

Eldertree (middle of block) 3.6 million gallons
Ridge Line Drive between Rocky View and Lazy Trial 12.7 million gallons
East Gate (end of street up the hill) Two tanks approx. 5 million gallons each.
Pathfinder Reservoir and Pump Station
Ambushers Reservoir
Armitos Reservoir & Pump Station
Diamond Bar Pump Station
Fernhollow Pump Station
Sylvan Glen Reservoir and Pump Station
North Diamond Bar Pump Station
Metropolitan Water District Line (runs to Deimer Filtration Plant in Yorba Linda)

Sewage Pump Stations – LA County Sanitation District

Diamond Bar Golf Course
Leyland Drive
Sycamore Canyon
Longview Drive
Fountain Springs
Indian Creek
Castle Rock
Horizon
Oak Knoll Drive
Vista Court
Brea Canyon

LPG Tanks, Natural Gas Line, Crude Oil:

| | |
|---|---|
| 1150 gallon LPG above ground tank | 850 Brea Canyon Road |
| 500 gallon LPG above ground tank | 21103 Golden Springs Road – Shell Oil Gas Station |

30" Natural Gas pipeline runs east to west across the City of Diamond Bar along Golden Springs and 60 Freeway.

Telecommunication Antennas

City owned Telecommunication Antennas are located at the East Gate water tank and on the AQMD/City Hall building.

Red Cross Disaster Shelters

According to Dave Amdahl for the Pomona Valley Chapter of American Red Cross Disaster Shelter sites are selected at time of need and the Red Cross has agreements with various facilities in the city which are utilized as shelters on an as needed basis.

Freeways

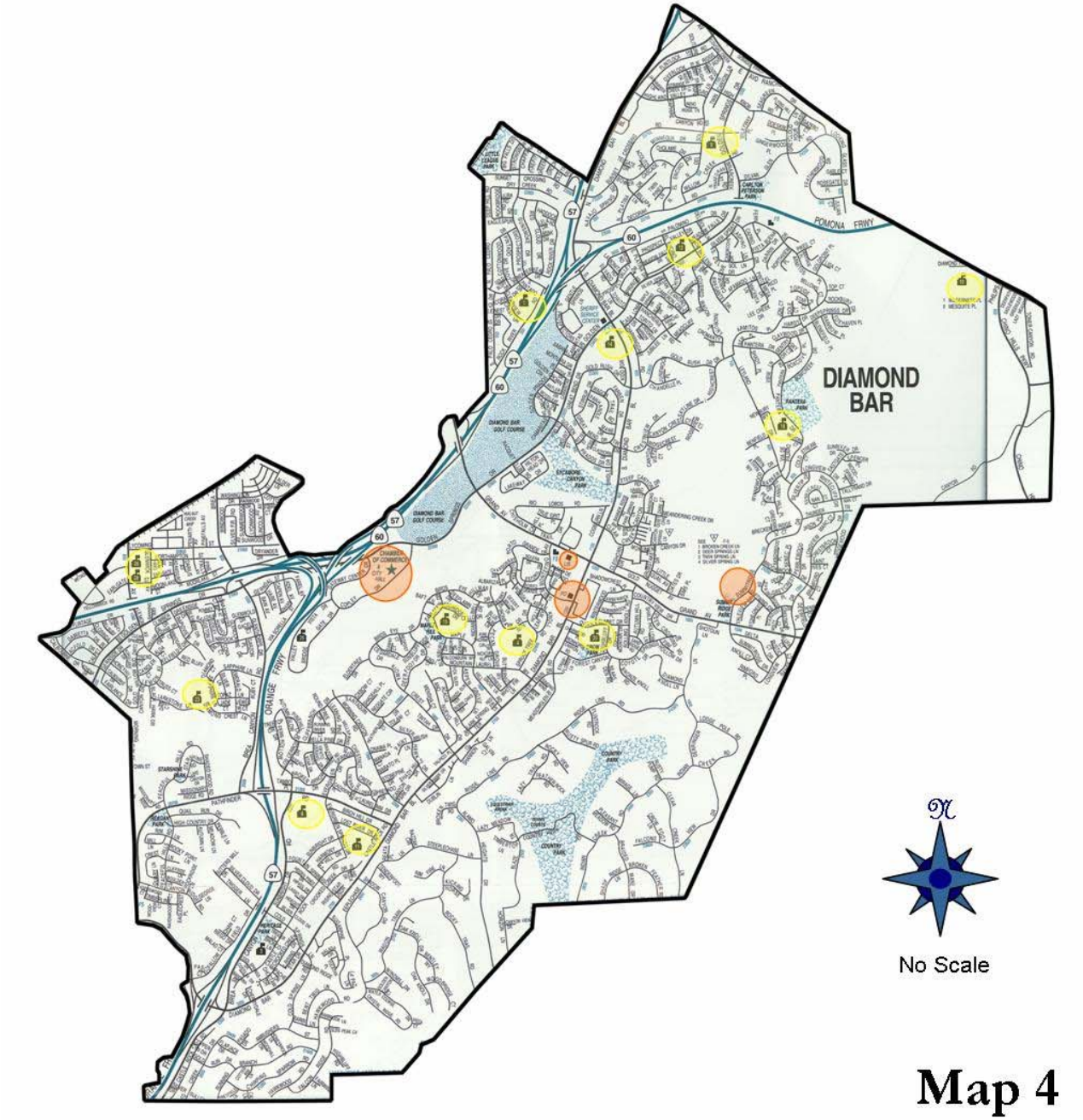
57 & 60 Freeways Interchange
Sunset Crossing Road @ 57 Freeway Underpass
Diamond Bar Boulevard @ 60 Freeway Underpass
Prospectors Road @ 57 & 60 Freeways Underpass
Golden Springs Drive @ 60 Freeway Underpass
Grand Ave. @ 60 Freeway Overpass

Brea Canyon Road @ 60 Freeway Underpass
Lemon Avenue @ 60 Freeway Underpass
Pathfinder Road@ 57 Freeway Overpass
Cold Springs Lane @ 57 Freeway Underpass
Brea Canyon Cut-Off Road @ 57 Freeway Underpass

Major Arterials
Grand Avenue
Golden Springs Drive
Diamond Bar Boulevard
Brea Canyon Road
Lemon Avenue
Pathfinder Road
Chino Hills Parkway

Large Employers:
SCAQMD, 21625 Copley Drive, 396-2000
Allstate Insurance
Travelers Insurance
Walnut Valley Unified School District
Pomona Unified School District
South Coast Cabinets
Acosta
Gateway Business Center
Bridgegate Business Center

Railroads – Southern Pacific and Union Pacific Railroad lines run along the northerly border of the City of Diamond Bar and City of Industry and there is a Metrolink Station is located in City of Industry just outside the City of Diamond Bar.



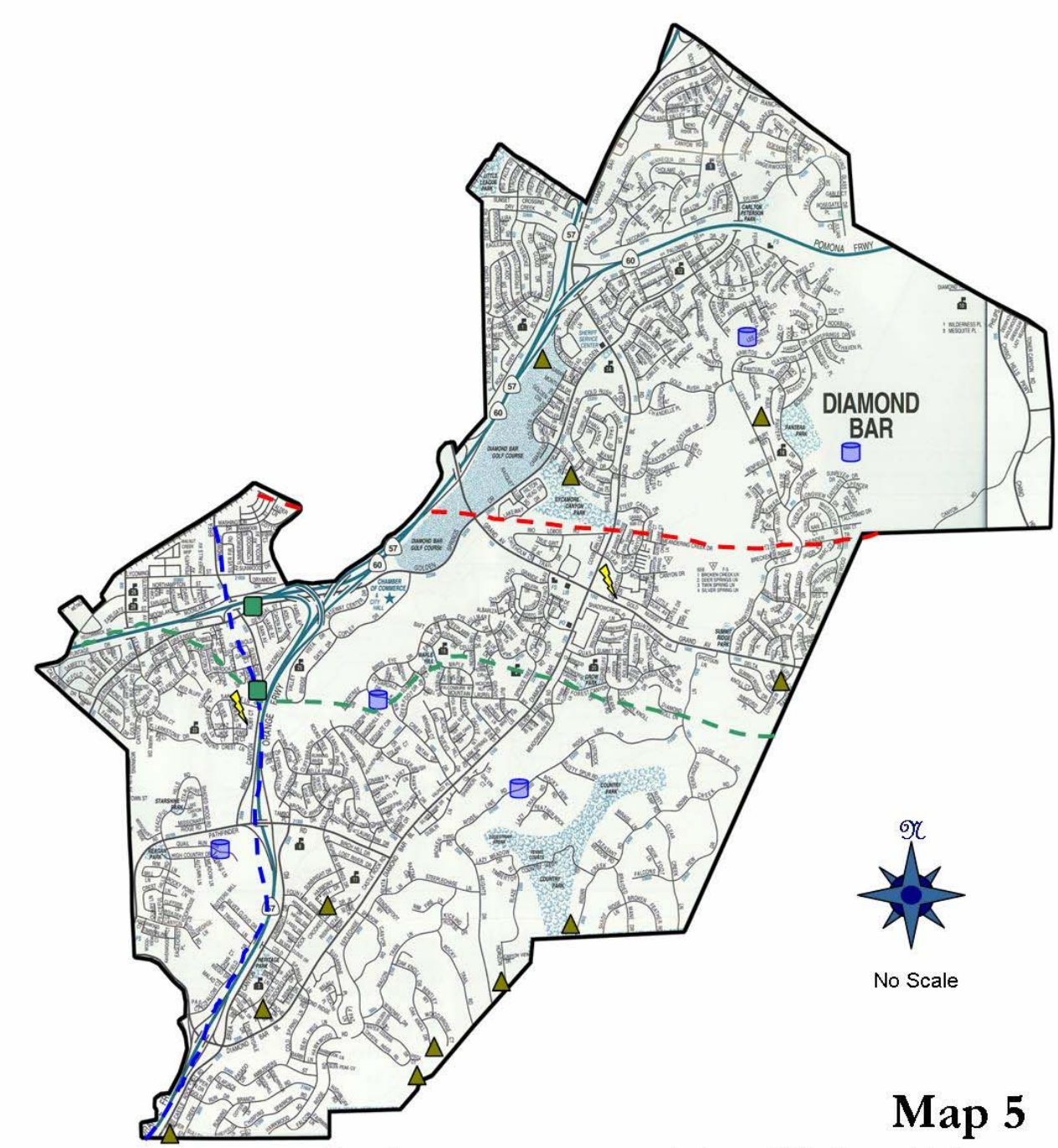

# Map 4
# Essential Facilities Map

LEGEND

Essential Facilities

Golf Course and Park Areas

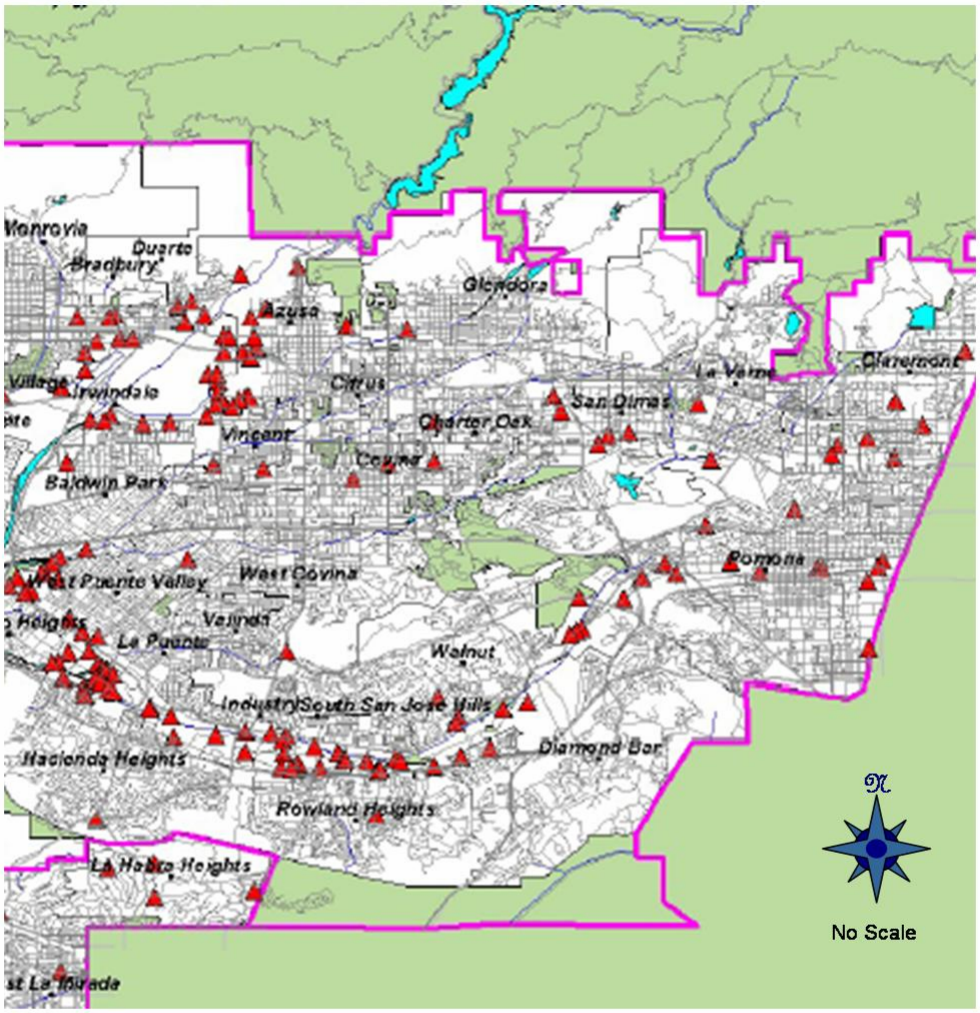
Public Schools




# Map 5
# Infrastructure Facilities Map

LEGEND

- Electrical Sub Station
- Electrical Transmission Line
- LPG Above Ground Tanks
- Natural Gas Line
- Sewer Pump Station
- Water Lines
- Water Tanks
- Golf Course and Park Areas




# Map 6
# Hazardous Materials Sites Map

LEGEND

Hazardous Material Sites

Unincorporated Areas

Disaster Management Boundaries

Source: Los Angeles County

*There are no hazardous material sites in Diamond Bar

**Summary**

Natural hazards mitigation strategies can reduce the impacts concentrated at large employment and industrial centers, public infrastructure, and critical facilities. Natural hazards mitigation for industries and employers may include developing relationships with emergency management services and their employees before disaster strikes, and establishing mitigation strategies together. Collaboration among the public and private sector to create mitigation plans and actions can reduce the impacts of natural hazards.

**Hazards Not Addressed**

**Drought**
Drought is caused by a lack of rain or potable water sources that would cause open space areas and agricultural land to dry up and no longer sustain vegetative life. Fire risk (see Section 9) in southern California is determined by a number of factors, including drought.

However, while drought can indeed occur in the Southern California area, the City of Diamond Bar and surrounding areas have sufficient potable water sources to render drought a non-threatening hazard. The subject of drought is also mentioned in Part II – Wildfires on Page 139.

**Tsunami**
A tsunami is a series of waves generated by an undersea disturbance such as an earthquake. From the area of the disturbance, the waves will travel outward in all directions, much like ripples caused by throwing a rock in a pond. The time between wave crests may be from 5 to 90 minutes, and the wave speed in the open ocean will average 450 miles per hour.

Tsunamis reaching heights of more than 100 feet have been recorded. As the waves approach the shallow coastal waters, they may appear normal and the speed decreases. Then as the tsunami nears the coastline, it may grow to great height and smash into the shore, causing great destruction. (Source: www.fema.gov/hazards/tsunamis/tsunami.shtm)

Because the City of Diamond Bar is located some thirty miles inland from the Pacific Ocean the potential hazard of tsunami is not considered a likely occurrence and accordingly will not be addressed in this Plan.

**Volcano**
A volcano is a mountain that opens downward to a reservoir of molten rock below the surface of the earth. Unlike most mountains, which are pushed up from below, volcanoes are built up by an accumulation of their own eruptive products: lava, ashflows and airborne ash and dust. When pressure from gases and the molten rock becomes strong enough to cause an explosion, eruptions occur. Gas and rock shoot up through the opening and spill over, or fill the air with lava fragments. Volcanic products are used as building or road-building materials, as abrasive and cleaning agents and as raw materials for many chemical and industrial uses. Lava ash makes soil rich in mineral nutrients. (Source: www.fema.gov/hazards/volcanoes/volcano.shtm)

Volcanic eruptions are most likely in the Pacific Rim states of Hawaii, Alaska, Washington, Oregon and California. The chance of eruptions that could damage populated areas is greatest for the active volcanoes of Hawaii and Alaska. Active volcanoes of the Cascade Mountain Range in California, Oregon and Washington have created problems recently. The danger area around a

volcano covers approximately a 20 mile radius. Some danger may exist 100 miles or more from a volcano.

The City of Diamond Bar is not in the danger zone of any volcano and is at least some 200 miles away from the nearest inactive volcano and some 500 miles away from the nearest active volcano. The potential hazard from volcanoes is not considered a likely occurrence and accordingly will not be addressed in this Plan.

## SECTION 4: MULTI-HAZARD GOALS AND ACTION ITEMS

This section provides information on the process used to develop goals and action items that pertain to the five natural hazards addressed in the mitigation plan. It also describes the framework that focuses the plan on developing successful mitigation strategies. The framework is made up of three parts: the Mission, Goals, and Action Items.

### Mission

The mission of the City of Diamond Bar Natural Hazards Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the City towards building a safer, more sustainable community.

### Goals

The plan goals describe the overall direction that the City of Diamond Bar agencies, organizations, and citizens can take to minimize the impacts of natural hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations that are outlined in the action items.

### Action Items

The action items are a listing of activities in which the City agencies and citizens can be engaged to reduce risk. Each action item includes an estimate of the time line for implementation. Short-term action items are activities that City agencies may implement with existing resources and authorities within one to two years. Long-term action items may require new or additional resources or authorities, and may take between one and five years (or more) to implement.

## MITIGATION PLAN GOALS AND PUBLIC PARTICIPATION

The Plan goals help to guide direction of future activities aimed at reducing risk and preventing loss from natural hazards. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items.

### Protect Life and Property

Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to natural hazards.

Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.

Improve hazard assessment information to make recommendations for discouraging new development and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

**Public Awareness**

Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.

Provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.

**Natural Systems**

Balance watershed planning, natural resource management, and land use planning with natural hazards mitigation to protect life, property, and the environment.

Preserve, rehabilitate, and enhance natural systems to serve natural hazards mitigation functions.

**Partnerships and Implementation**

Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.

Encourage leadership within public and private sector organizations to prioritize and implement local, county, and regional hazards mitigation activities.

**Emergency Services**

Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.

Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.

Coordinate and integrate natural hazards mitigation activities, where appropriate, with emergency operations plans and procedures.

## GOALS AND OBJECTIVES

### Background

One of the steps in preparing the Natural Hazards Mitigation Plan (NHMP) as mandated by the Federal Disaster Management Act of 2000 is the formulation of goals and objectives. A goal is a statement of intent and an objective provides directives on how to achieve that goal. The goals and objectives will serve as a framework for formulating the mitigation program in the NHMP for Diamond Bar.

The following goals and objectives proposed are based on a direction provided by the Disaster Management Area Coordinator (DMAC) for Area "D", Brenda Hunemiller. The DMAC template has been customized for the City of Diamond Bar based on the input of NHMP Planning Committee and the community and on the conclusions of the initial hazard identification analysis.

**Goals and Objectives Framework**

**1. Protect Life and Property**

***Goal 1.1:*** **Reduce the potential for life loss, injury and economic damage to Diamond Bar residents.**

- *Objective 1.1.1:* Increase the resilience of institutions, services and lifeline systems that are essential to Diamond Bar's operation and functioning.

- *Objective 1.1.2:* Increase the ability of City government to serve the community during and after hazard events through response, recovery and rebuilding.

- *Objective 1.1.3*: Recognize the potential for greater impacts in hillside development and urban wildland interface in emergency response and mitigation planning.

- *Objective 1.1.4:* Continue to utilize the emergency management system to provide early warning of and response to all life-threatening hazards that can be predicted, such as earthquakes, floods, landslides, wildfires and windstorms.

***Goal 1.2:*** **Protect Diamond Bar's unique character and values from being compromised by hazard events.**

- *Objective 1.2.1:* Encourage and support the long-term protection of the unique natural hillside environment and preserve neighborhood and community character.

- *Objective 1.2.2:* Support the long-term protection of Diamond Bar's neighborhoods by reducing the potential impact to structures from hazard events.

- *Objective 1.2.3*: Support measures that effectively address the hazard potential while preserving the unique aspects of neighborhood while promoting business enterprises.

***Goal 1.3:*** **Minimize losses to existing property and reduce potential for damage to future development.**

- *Objective 1.3.1:* Coordinate land use plans and regulations to direct development away, or buffer development from, area and site-specific hazards.

- *Objective 1.3.2:* Continue maintenance programs, such as site inspection and brush removal, to reduce the potential for wildfire and other problems.

- *Objective 1.3.3:* Continue to ensure that new buildings and substantial improvements to existing building are governed by and incorporate all appropriate building codes and construction measures to protect them against failure or damage.

**2. Public Awareness**

***Goal 2.1:*** **Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.**

- *Objective 2.1.1:* Develop targeted educational and outreach programs to segments of the community that are most at-risk to hazards events.

- *Objective 2.1.2:* Encourage the distribution of information to residents, businesses and public employees on safety and health precautions to take in advance of and during a disaster.

- *Objective 2.1.3:* Encourage residents and businesses in taking appropriate mitigation steps to protect their properties.

- *Objective 2.1.4*: Aid both private and public sectors in understanding the risks they may be exposed to and finding mitigation strategies to reduce those risks.

- *Objective 2.1.5:* Prioritize community education and outreach in natural hazards mitigation planning.

- *Objective 2.1.6:* Utilize local organizations and community partners in preparedness training and post-disaster assistance.

**3. Natural Systems**

***Goal 3.1:*** **Balance natural resource management, and land use planning with natural hazard mitigation to protect life, property and the environment.**

- *Objective 3.1.1:* Preserve, rehabilitate and enhance natural systems to serve natural hazard mitigation functions appropriately.

- *Objective 3.1.2:* Minimize potential negative environmental impacts from mitigation efforts.

**4. Partnerships and Implementation**

***Goal 4.1:*** **Encourage and support leadership within Diamond Bar to promote and implement local hazard mitigation activities.**

- *Objective 4.1.1:* Maintain communication and coordination with public agencies, citizens, non-profit organizations, business and industry to ensure support for implementation.

- *Objective 4.1.2:* Provide information on tools, partnership opportunities and funding resources to assist in implementing mitigation activities.

- *Objective 4.1.3:* Coordinate and integrate natural hazards mitigation activities with local land development planning activities and emergency operations planning.

- *Objective 4.1.4:* Continue developing and strengthening inter-jurisdictional coordination and cooperation in the area of emergency services.

- *Objective 4.1.5:* Maintain partnerships with facilities and institutions with populations that are particularly vulnerable to risks associated with natural hazards, including emergency planning and post-disaster contingency plans.

- *Objective 4.1.6:* Coordinate with utility and transportation providers to establish and maintain early warning systems.

- *Objective 4.1.7:* Periodically review and update the Natural Hazards Mitigation Plan, taking into consideration new hazard information, changes in vulnerabilities and critical facilities and advancement in emergency response and post-disaster services.

## 5. EMERGENCY SERVICES

***Goal 5.1:*** **Establish mitigation projects for emergency services, critical and essential facilities and infrastructure to ensure continued operations when the City is impacted by natural hazard events.**

- *Objective 5.1.1:* Prioritize funding and implementation schedules for improvements needed to ensure continuous and extensive emergency response capabilities.

- *Objective 5.1.2:* Maintain emergency operations through continued collaboration and coordination among public agencies, non-profit organizations, business and industry.

- *Objective* 5.*1.3:* Coordinate and integrate natural hazards mitigation activities, where appropriate, with emergency operations plans and procedures.

- *Objective 5.1.4:* Continue providing emergency services with training and equipment to address all identified hazards.

- *Objective 5.1.5:* Conduct periodic emergency preparedness drills involving City Staff and emergency services providers, critical facilities, utility operators, community partners and institutions with vulnerable populations.

## Public Participation

Public input during development of the mitigation plan assisted in creating plan goals. Meetings with the project steering committee, stakeholder interviews, and a public workshop served as methods to obtain input and identify priorities in developing goals for reducing risk and preventing loss from natural hazards in the City of Diamond Bar.

On May 18, 2004, the first City Council Study Session was held to explain the Plan requirements, the process for completion and the goals for the City of Diamond Bar Natural Hazards Mitigation Plan. The City Council approved a Resolution supporting the development of the Plan.

The second public workshop was held September 21, 2004 to review mitigation plan action items and provide the Council with a chance to comment on the final plan recommendations.

## NATURAL HAZARDS MITIGATION PLAN ACTION ITEMS

The mitigation plan identifies short and long-term action items developed through data collection and research, and the public participation process. Mitigation plan activities may be considered for funding through Federal and State grant programs, and when other funds are made available through the city. Action items address multi-hazard (MH) and hazard specific issues. To help ensure activity implementation, each action item includes information on the time line and coordinating organizations. Upon implementation, the coordinating organizations may look to partner organizations for resources and technical assistance. A description of the partner organizations is provided in Appendix B, the Resource Directory of this plan.

**Coordinating Organization**
The coordinating organization is the organization that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation. Coordinating organizations may include local, city, or regional agencies that are capable of or responsible for implementing activities and programs.

**Time line**
Action items include both short and long-term activities. Each action item includes an estimate of the time line for implementation. Short-term action items are activities that city agencies may' implement with existing resources and authorities within one to two years. Long-term action items may require new or additional resources or authorities, and may take between one and five years (or more) to implement.

**Ideas for Implementation**
Each action item includes ideas for implementation and potential resources, which may include grant programs or human resources.

**Plan Goals Addressed**
The plan goals addressed by each action item are included as a way to monitor and evaluate how well the mitigation plan is achieving its goals once implementation begins.

**Constraints**
Constraints may apply to some of the action items. These constraints may be a lack of city staff, lack of funds, or vested property rights which might expose the City to legal action as a result of adverse impacts on private property.

**Mitigation Action Plan**
Risks associated with natural hazards in Diamond Bar are reduced through a variety of programs implemented by Federal, State and local government agencies, including the City of Diamond Bar. This section sets forth the mitigation action plan that the City is committed to implementing to eliminate, avoid or reduce the likelihood of specific risks from occurring in the unfortunate event of earthquake, landslide, flooding, wildfire or windstorm and to maximize the effectiveness of the emergency response system to avoid injury, life loss and property damage.

These mitigation actions represent the culmination of the research, mapping, analysis and community outreach conducted for the NHMP. The mitigation actions are based on:

- ✓ Risks associated with critical facilities and community vulnerabilities that have been rated as having medium to high community impact potential;

- ✓ NHMP mission, goals and objectives, per Planning Committee input; and,

- ✓ Input from City staff, stakeholders and additional research performed by the facilitator/consultant.

In the process of formulating the mitigation action plan, the Planning Committee reviewed a series of draft mitigation measures and provided feedback on cost-effectiveness, political will, technical feasibility and environmental soundness. During this process the Planning Committee helped to identify additional mitigation as well as improve the feasibility and effectiveness of the proposed mitigation given Diamond Bar's unique characteristics and needs.

In addition, for each item, the following are documented:

- Natural hazards addressed;

- Goals and Objectives Implemented: it should be noted that many of the mitigation actions are designed to achieve multiple goals and objectives;

- Lead Department; and

- Implementation Schedule, whereby "Short-term" denotes anticipated implementation within two years of NHMP adoption, "Mid-term" denotes anticipated implementation within five years of NHMP adoption; and "On-going" denotes continuous implementation from year to year. Mitigation actions currently underway are noted as appropriate. The City will continue to seek assistance through federal, State and regional funding programs.

**Prioritization of Mitigation Items**

Each of the following mitigation action items addresses the goals and objectives outlined in Section 4 of this plan. These action items are identified, evaluated, and prioritized here, forming the core of the mitigation plan. To do so, the City assessed the capabilities of its resources to support hazard mitigation planning needs. This capabilities assessment was conducted using FEMA's STAPLE+E Parameters (social, technical, administrative, political, legal, economic, and environmental). Upon completion of the assessment, hazard mitigation strategies were evaluated and prioritized, resulting in a list of acceptable and realistic actions addressing the identified hazards. Action Items scoring under 30 on the STAPLE+E Worksheet are identified as "Priority One" items, while those scoring over 30 are identified as "Priority Two" items. Please see Appendix A for the STAPLE+E Worksheet, Implementation Worksheet, and individual tables of the "Priority One" and "Priority Two" items.

**Mitigation Action Items**

1. **NHMP Implementation Structure**

   **Mitigation Action: 1.1: Coordinator and Action Committee.**

   Designate a Hazards Mitigation Coordinator and a Natural Hazards Mitigation Action Committee to oversee NHMP implementation. The Coordinator will be responsible for:

- Overseeing implementation of the NHMP.

- Preparing an Annual Report to the City Council—in coordination with aforementioned Natural Hazards Action Committee---that details mitigation action items to implement in the upcoming year, including cost estimates, cost/benefit and/or cost-effectiveness analyses and recommendations for items for possible inclusion in the Budget process.

- Updating the NHMP every five years---in coordination with the Natural Hazards Action Committee by reviewing the effectiveness of mitigation implementation, addressing changes in critical facilities and vulnerabilities, incorporating advancements in emergency response and post-disaster services and updating hazard and risk assessments as new information becomes available. This includes incorporating new information from federal, State or regional hazard mapping and identification efforts.

- Establishing and maintaining the roster for the Action Committee, calling and conducting meetings including preparation of agendas and necessary information materials for meeting.

- Attendance at monthly Area "D" General Meetings.

The Natural Hazards Action Committee will be comprised of representatives of City departments involved in NHMP implementation; representatives of critical sites and facilities; and community representatives involved in emergency preparedness and response; and representatives of the Community Emergency Response Team (CERT) and Diamond Bar Amateur Radio System (DBARS) programs. In addition to these duties, the Action Committee should provide input on community disaster preparedness and education efforts.

| | |
|---|---|
| **Lead Department:** | City Manager's Office |
| **Implementation Schedule:** | Ongoing |
| **Hazards Addressed:** | All |
| **Goals and Objectives Implemented:** | All |
| **Priority:** | **One** |

**Mitigation Action 1.2: Implementation Options for Hazards Mitigation**

Secure necessary funding for implementation of hazards mitigation action as follows:

- Allocate City resources and assistance for hazards mitigation projects, using available City resources efficiently and with consideration of cost-effectiveness analysis;

- Identify and seek grant programs and foundations that may support mitigation activities; and

- Partner with other government agencies, special districts, utility providers and organizations involved in hazards mitigation and emergency preparedness and response to pursue grants and special funding programs.

In addition, utilize incentive programs for local community members and businesses to pursue hazards mitigation projects.

**Lead Department:** City Manager or other Department depending on the specific project
**Implementation Schedule:** Ongoing
**Hazards Addressed:** All
**Goals and Objectives Implemented:** All
**Priority:** **One**

2. **Critical Facilities and Emergency Operations Center (EOC)**

**Mitigation Action 2.1: Maintain Integrity of Emergency Operations Center System.**

Maintain the system of the Emergency Operations Center (City Hall) with alternative back-up facilities (Diamond Bar Center, Heritage Park Community Center) to be activated in the event the central facility is impaired. Because City government operations may be effected if back-up locations must be activated, develop the portable EOC-in-a-box Program and train staff in its use.

**Lead Department:** City Manager/Public Safety
**Implementation Schedule:** Short-term and long-term
**Hazards Addressed:** All

**Goals and Objectives Implemented:**

Goal 1.1: Reduce the potential for life loss, injury and economic damage to Diamond Bar residents and businesses by maximizing emergency preparedness capabilities (Objectives 1.1.1, 1.1.2, 1.1.4).

Goal 5.1: Ensure continued operations when the City is impacted by natural hazards events (Objectives 5.1.1, 5.1.3, 5.1.4).

**Priority:** **One**

3. **Improve Communication and Coordination with Utilities and Other Critical Facility Providers.**

**Mitigation Action 3.1: Communication/Early Warning Systems and Local Consideration.**

Review the disaster preparation, response and early warning programs of neighboring jurisdictions, agencies and utilities servicing the community. Also contact private companies (including railroads) to ensure that the needs of Diamond Bar are addressed in planning and infrastructure improvement initiatives. Advocate making the City a primary recipient of early hazard warning and renew or establish communication protocols.

**Lead Department:** City Manager's Office
**Implementation Schedule:** Ongoing
**Hazards Addressed:** All

**Goals and Objectives Implemented:**
Goal 1.1: Reduce the potential for life loss, injury and economic damage to Diamond Bar residents and businesses by maximizing emergency preparedness capabilities (Objectives 1.1.1, 1.1.2, 1.1.4).

Goal 4.1: Encourage and support leadership within Diamond Bar to promote and implement local hazards mitigation activities (Objectives 4.1.1, 4.1.3, 4.1.5).

**Priority:** **Two**

4. **Secure Geographic Information System Access**

**Mitigation Action 4.1 Develop Geographic Information System (GIS) Program Capability for Improved Mapping and Planning.**

To aid with Disaster planning and preparation the City needs to considered securing a Geographic Information System. A GIS program would not only benefit in Emergency Services and Disaster preparation but also aid all city departments. GIS is a method to visualize, manipulate, analyze and display spatial data. It can be utilized to develop "Smart Maps", predict future trends and monitor environmental issues. GIS combines layers of information about a place to demonstrate a better understanding of that place. GIS would greatly improve Diamond Bar's capability to mitigate natural hazards and plan for reducing vulnerabilities.

**Lead Departments:** Public Works, Community Services
**Implementation Schedule:** Complete
**Hazards Addressed:** All

**Goals and Objectives Implemented:**

Goal 1.1: Reduce the potential for life loss, injury and economic damage to Diamond Bar residents (Objective 1.1.1, 1.1.2).

Goal 4.1: Encourage and support leadership within Diamond Bar to promote and implement local hazards mitigation activities. (Objective 4.1.1, 4.1.2, 4.1.3, 4.1.4).

**Priority:** **One**

5. **Community Preparedness and Education**

**Mitigation Action 5.1: Emergency Preparedness Campaign.**

Continue implementing customized public education campaign for residents and businesses about appropriate emergency preparedness measures and what to do in the event of a disaster. Develop a special annual theme and topic to increase awareness and to try and grab the public attention using the following communication:

- Incorporation of special publications and inserts in the City's newsletter and other mailings such as utility bills;

- Develop a traveling Public Education booth to set up at City events, in shopping centers, community centers/public counters, schools and other activity centers;

- Post information on City's website;

- Media releases;

- Study sessions with City Council and commissioners;

- Presentations to community organizations and service clubs and dissemination of literature through organizations' membership networks---Diamond Bar's strong community networks are one of the best mechanisms for reaching residents and small business owners;

- Coordination with Walnut Valley and Pomona Unified School Districts to distribute information to families with children and to conduct preparedness activities;

- Target high risk and vulnerable populations for special emphasis; and

- Include education and training for City of Diamond Bar employees.

When developing and designing the disaster preparedness and public education campaign, special attention shall be paid to language, demographic and cultural characteristics of the Diamond Bar population to maximize its effectiveness. Information should be periodically distributed about non-structural improvements to mitigate hazard risks, such as securing bookcases, filing cabinets, light fixtures and similar objects that can cause injuries and block exits.

**Lead Department:** City Manager's Office, Public Information, Public Safety
**Implementation Schedule:** Ongoing
**Hazards Addressed:** All

**Goals and Objectives Implemented:**

Goal 2.1: Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards (Objectives 2.1.1 – 2.1.6).

Goal 4.1: Encourage and support leadership within Diamond Bar to promote and implement local hazards mitigation activities (Objectives 4.1.1, 4.1.2, 4.1.4).

**Priority:** **One**

**Mitigation Measure 5.2: Community Emergency Volunteers.**

Enhance involvement and partnership with Community Emergency Response Team (CERT) program, the Diamond Bar Amateur Radio System, (DBARS) and Neighborhood Watch Organizations to build and train teams of community residents, leaders and stakeholders to assist with emergency response and first aid. Make use of existing community networks to enlist participants.

| | |
|---|---|
| **Lead Department:** | City Manager's, Public Safety, Sheriff's and Fire Departments |
| **Implementation Schedule:** | Short-term |
| **Hazards Addressed:** | All |

**Goals and Objectives Implemented:**

Goal 1.1: Reduce the potential for life loss, injury, and economic damage to Diamond Bar residents and businesses by maximizing emergency preparedness capabilities (objectives 1.1.2, 1.1.3).

Goal 2.1: Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards (Objectives 2.1.2, 2.1.3).

Goal 4.1: Encourage and support leadership within Diamond Bar to promote and implement local hazards mitigation activities (Objectives 4.1.1, 4.1.4).

Goal 5.1: Ensure continued operations when the City is impacted by natural hazards events (Objectives 5.1.4, 5.1.6).

**Priority:** **Two**

6. **Resilient Housing, Neighborhoods and Commercial Districts**

**<u>Mitigation Action 6.1: Reduced Wildfire Threat.</u>**

Continue existing programs requiring use of fire-resistant roof materials, brush clearance, and weed abatement and landscaping programs, along with periodic inspection by County Fire Department personnel, in existing developments located in and around areas prone to wildfire, to avoid structural damage and/or injury.

| | |
|---|---|
| **Lead Department:** | City Manager's Office, Fire Department |
| **Implementation Schedule:** | Ongoing |
| **Hazards Addressed:** | Wildfire |

**Goals and Objectives Implemented:**

Goal 1.3: Minimize losses to existing property and reduce potential for damage to future development (Objective 1.3.1).

Goal 3.1: Balance natural resource management and land use planning with natural hazards mitigation to protect life, property and the environment (Objectives 3.1.1, 3.1.2).

**Priority:** **One**

**Mitigation Action 6.2: Landslide Prevention.**
Prioritize routine maintenance and repairs of water and sewer storm drain lines in and around landslide prone areas to avoid long-term leaks that saturate and de-stabilize earth materials to the point of dangerous and destructive landslides.

**Lead Department:** Public Works, Los Angeles County Department of Public Works, Walnut Valley Water District
**Implementation Schedule:** Ongoing
**Hazards Addressed:** Landslides and Earth Movement.

**Goals and Objectives Implemented:**

Goal 3.1: Balance natural resource management and land planning with natural hazards mitigation to protect life, property and the environment. (Objectives 3.1.1, 3.1.2).

**Priority:** **One**

**Mitigation Action 6.3: Landslide Prevention – Code Compliance/Interdepartmental Communication/Public and Contractor Education.** Continue to require that all hillside/steep slope construction and/or improvements be reviewed by a Soils and Geotechnical Engineer for soil stability. Continue communication and coordination between the City's Engineering, Planning and Building & Safety Departments to address any proposed developments that are in areas with slope stability risks.

Educate residents yearly through articles explaining how to care for storm water drainage devices located on their property in order to prevent back up and possible saturation of soil. Place articles in local newspaper publications as well as the City of Diamond Bar's monthly "City News" which is mailed to every household.

Provide informational brochures to the public on protecting personal property from erosion due to excessive landscape irrigation, damaged and/or clogged drainage swales, and other drainage devices.

Provide informational brochures to contractors providing services to the homeowner to reduce the risks of landslides through proper usage of drainage devices and landscape sprinklers.

**Hazards Addressed:** Landslides and Earth Movement.
**Lead Department:** Public Works, Building and Safety
**Implementation Schedule:** Ongoing
**Goals and Objectives Implemented:**

1-Protect Life and Property, 2-Public Awareness, 3-Natural Systems, 4-Parnerships and Implementation.

Goal 3.1: Balance natural resource management and land planning with natural hazards mitigation to protect life, property and the environment. (Objectives 3.1.1, 3.1.2).

**Priority:** **One**

**Mitigation Action 6.4: Flood Prevention.**

Maintain routine maintenance of down and bench drains in and around residential and commercial areas to avoid accumulation of debris which could lead to dangerous and destructive flooding.

**Lead Department:** Public Works and LA County Flood Control District
**Implementation Schedule:** Ongoing
**Hazards Addressed:** Floods

**Goals and Objectives Implemented:**

Goal 1.2: Protect Diamond Bar's unique character and values from being compromised by hazards events (Objective 1.2.3).

Goal 3.1: Balance natural resource management and land use planning with natural hazards mitigation to protect life, property and the environment (objectives 3.1.1, 3.1.2).

**Priority:** **One**

**Mitigation Action 6.5: Earthquake Preparedness:** Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices.

Ideas for Implementation

- Provide information to government building and school facility managers and teachers on securing bookcases, filing cabinets, light fixtures, and other objects that can cause injuries and block exits;
- Encourage facility managers, business owners, and teachers to refer to FEMA's practical guidebook: "Reducing the Risks of Nonstructural Earthquake Damage";
- Encourage homeowners and renters to use "Is Your Home Protected from Earthquake Disaster? A Homeowner's Guide to Earthquake Retrofit" (IBHS) for economic and efficient mitigation techniques;
- Explore partnerships to provide retrofitting classes for homeowners, renters, building professionals, and contractors; and
- Target development located in potential fault zones or in unstable soils for intensive education and retrofitting resources,

**Lead Department:** Hazards Mitigation Action Committee
**Implementation Schedule:** Ongoing
**Hazards Addressed:** Earthquake

**Goals and Objectives Implemented:** Protect Life and Property, Public Awareness

**Priority:** **One**

**Mitigation Action 6.6: Earthquake Understanding:** Improve knowledge of Earthquake hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas.

Ideas for Implementation

- Update the City of Diamond Bar earthquake hazard map with any new developments or recent earthquake activity.
- Provide public information to emphasize economic risk when building on potential or historical Earthquake areas.

**Lead Department:** Community Development
**Implementation Schedule:** Ongoing
**Hazards Addresses:** Earthquake

**Goals and Objectives Implemented:** Protect Life and Property, Earthquake mitigation

**Priority:** **Two**

**Mitigation Action 6.7: Earthquake Construction Design:** Encourage construction and subdivision design that can be applied to steep slopes to reduce the potential adverse impacts from development.

Ideas for Implementation

- Continue to require that all hillside slope construction, be reviewed by Geo-Technical Engineer along with structural engineer.
- Increase communication and coordination between the City's Engineering and Building & Safety and Planning Departments to address any proposed developments that are within the Restrictive Land Use areas.
- Strictly execute Section 18 of the Current California code as it applies to building setbacks from top to toe of slope.

**Lead Department:** Community Development
**Implemented Schedule:** Ongoing
**Hazards Addresses:** Earthquake

**Goals and Objectives Implemented:** Protect Life and Property, Earthquake Damage Mitigation

**Priority:** **One**

**Mitigation Action 6.8: Earthquake Building Codes:** Review and revise building codes for any development in Earthquake prone areas.

- Structural member values have been reduced, which means that larger framing and structural members are to be used.
- Strict design criteria are mandated for both commercial and residential structures.
- Other changes include penetration through firewalls, flame barriers, parapet construction, labels for fire doors, and sprinklers requirements for "U" occupancies, means of egress and exit travel requirements through intervening rooms.

- Attic and laundry ventilation.
- Design loads for patio covers.
- Anchorage of concrete or masonry walls in seismic zone 3 and 4. Prescriptive sill bolting requirements for seismic zone 3 and 4 has been increased.

**Lead Department:** Community Development
**Implementation Schedule:** Ongoing
**Hazards Addressed:** Earthquake

**Goals and Objectives Implemented:** Protect Life and Property, Earthquake Damage Mitigation

**Priority:** **One**

**Mitigation Action 6.9: Windstorm Preparedness.** Maintain local City and utility awareness of tree pruning and Fire Code Sections relevant to wind-resistant utility operations.

Provide information to City Planning Departments and local utility companies encouraging compliance with State and Local tree clearance and integrity guidelines by:

- Compile comprehensive list of pertinent State and local regulations
- Send letters of encouragement from Hazards Mitigation Planning Committee and local City and School officials encouraging utility compliance with guidelines

**Lead Department:** Community Services, Planning Dept, Public Works, Emergency Services Offices
**Priority:** First
**Hazards Addressed:** Windstorm
**Implementation Schedule:** Ongoing
**Goals and Objectives Implemented:** 1. Protect Life and Property, 2. Public Awareness, 4. Partnerships and Implementation, 5. Emergency Services

**Priority:** **One**

**Mitigation Action 6.10: Restricted Use Areas.**
Maintain the City's Restricted Use Area zones related to development standards for hillside properties to include best management practices for hazard and landslide prevention.

**Lead Department:** Public Works, Building and Safety
**Implementation Schedule:** Ongoing
**Hazards Addressed:** All

**Goals and Objectives Implemented:**
Goal 1.2: Protect Diamond Bar's unique character and values from being compromised by hazard events (Objectives 1.2.1, 1.2.2, 1.2.3).

**Priority:** **One**

**7. Risk Reduction for Community Vulnerabilities**

**Mitigation Action 7.1: Accelerated Emergency Response for Vulnerable Populations.**

Many of the mitigation actions established in the NHMP will act to reduce risks associated with the vulnerable populations in the City, including persons in daycare or senior care facilities and schools. In addition, focused response efforts may be needed in the event of disaster to ensure the safety of these vulnerable populations. As a part of the plan to step up emergency response efforts for vulnerable facilities:

- Maintain updated inventory and map of vulnerable and mapping of vulnerable facilities in the Emergency Preparedness Plan to help identify facilities that need special response service and integrate vulnerable facilities into the communication protocol;

- Request representatives from vulnerable facilities to participate in emergency preparedness drills; and

- Request representatives from vulnerable facilities to participate in the CERT program described in Mitigation Action 5.2.

**Lead Department**: City Manager's Office, Public Safety
**Implementation Schedule:** Short-term
**Hazards Addressed:** All

**Goals and Objectives Implemented:**
Goal 1.1: Reduce the potential for life loss, injury, and economic damage to Diamond Bar residents and businesses by maximizing emergency preparedness capabilities (Objectives 1.1.1, 1.1.3).

Goal 2.1: Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards (Objectives 2.1.2).

Goal 4.1: Encourage and support leadership within Diamond Bar to promote and implement local hazards mitigation activities (Objectives 4.1.4).

Goal 5.1: Ensure continued operations when the City is impacted by natural hazards events. (Objective 5.1.6).

**Priority:** **One**

**8. City Emergency Preparedness Planning and Training**

**Mitigation Action 8.1: Diamond Bar Emergency Preparedness Plan.**

Continue to implement the Diamond Bar Emergency Preparedness Plan, which functions as the City's manual for communication protocol in the event of disaster. Update as needed for consistency with the State Standardized Emergency Management System (SEMS) Multi-hazard Functional Plan, evolving inter-agency protocols and the NHMP.

**Lead Department:** City Manager's Office, Public Safety

**Implementation Schedule:** Short-term
**Hazards Addressed:** All

**Goals and Objectives Implemented:**

Goal 1.1: Reduce the potential for life loss, injury, and economic damage to Diamond Bar residents and businesses by maximizing emergency preparedness capabilities (objectives 1.1.2, 1.1.3).

Goal 1.2: Protect Diamond Bar's unique character and values from being compromised by hazard events (Objectives 1.2.1, 1.2.2, 1.2.3).

Goal 1.3: Minimize losses to existing property and reduce potential for damage to future development (Objective 1.3.1).

**Priority:** **One**

**Mitigation Item 8.2: City SEMS Planning and Training.**
Continue to implement the Diamond Bar SEMS Plan, which functions as the City's manual for communications protocol in the event of a disaster. Update as needed for consistency with the State's SEMS Plan, evolving inter-agency communication protocols and NHMP.

**Lead Department:** City Manager's Office, Public Safety
**Implementation Schedule:** Short-term
**Hazards Addressed:** All

**Goals and Objectives Implemented:**
Goal 1.1: Reduce the potential for life loss, injury, and economic damage to Diamond Bar residents and businesses by maximizing emergency preparedness capabilities (objectives 1.1.2, 1.1.3, and 1.1.4).

Goal 2.1: Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards (Objectives 2.1.1, 2.1.2, 2.1.3, 2.1.4).

Goal 4.1: Encourage and support leadership within Diamond Bar to promote and implement local hazards mitigation activities (Objectives 4.1.1, 4.1.3, 4.1.4, 4.1.5).

Goal 5.1: Ensure continued operations when the City is impacted by natural hazards events (Objective 5.1.2, 5.1.3).

**Priority:** **One**

**Mitigation Action 8.3: Emergency Preparedness Drills.**
Pursuant to the City's Emergency Preparedness Plan, conduct emergency preparedness and response drills for mock major earthquake events – the natural hazards with the greatest potential for injury, life loss, property damage and service interruptions. Drills should test disaster response systems and communication protocols. When preparing the drills, consider the wide range of potential risks associated with critical facilities and vulnerabilities. Include

City officials and staff, utility providers and CERT team members, emergency response stakeholders and representatives of vulnerable facilities.

**Lead Department:** City Manager's Office, Public Safety
**Implementation Schedule:** Ongoing, on an annual basis
**Hazards Addressed:** All

**Goals and Objectives Implemented:**
Goal 1.1: Reduce the potential for life loss, injury, and economic damage to Diamond Bar residents and businesses by maximizing emergency preparedness capabilities (objectives 1.1.1, 1.1.2, 1.1.3, 1.1.4).

Goal 2.1: Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards (Objectives 2.1.1, 2.1.2, 2.1.3, 2.1.4).

Goal 4.1: Encourage and support leadership within Diamond Bar to promote and implement local hazards mitigation activities (Objectives 4.1.1, 4.1.3, 4.1.4, 4.1.5).

Goal 5.1: Ensure continued operations when the City is impacted by natural hazards events (Objective 5.1.2, 5.1.3. 5.1.4, 5.1.6).

**Priority:** **Two**

**Mitigation Action 8.4: City Hall Life Safety Planning and Evacuation Exercises.**
Update life safety preparedness plan, conduct employee training and hold emergency evacuation drills in conjunction with AQMD at City Hall and at all other City facilities on an annual basis.

**Lead Department:** Public Safety, City Manager's Office and Fire Department
**Implementation Schedule:** On an annual basis
**Hazards Addressed:** All

**Goals and Objectives Implemented:**
Goal 1.1: Reduce the potential for life loss, injury, and economic damage to Diamond Bar residents and businesses by maximizing emergency preparedness capabilities (objectives 1.1.1, 1.1.2, 1.1.3, 1.1.4).

Goal 2.1: Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards (Objectives 2.1.1, 2.1.2, 2.1.3, 2.1.4).

Goal 4.1: Encourage and support leadership within Diamond Bar to promote and implement local hazards mitigation activities (Objectives 4.1.1, 4.1.3, 4.1.4, 4.1.5).

Goal 5.1: Ensure continued operations when the City is impacted by natural hazards events (Objective 5.1.2, 5.1.3. 5.1.4, 5.1.6).

**Priority:** **Two**

## SECTION 5: PLAN MAINTENANCE

The plan maintenance section of this document details the formal process that will ensure that the City of Diamond Bar Natural Hazards Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how the City will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how the City of Diamond Bar government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms such as the City General Plan, Capital Improvement Plans, and Building and Safety Codes.

### Monitoring and Implementing the Plan

### Plan Adoption

The City Council will be responsible for adopting the City of Diamond Bar Natural Hazards Mitigation Plan. This governing body has the authority to promote sound public policy regarding natural hazards. Once the plan has been adopted, the City Emergency Manager will be responsible for submitting it to the State Hazard Mitigation Officer at The Governor's Office of Emergency Services. The Governor's Office of Emergency Services will then submit the plan to the Federal Emergency Management Agency (FEMA) for review. This review will address the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA, the City of Diamond Bar will gain eligibility for Hazard Mitigation Grant Program funds.

### Coordinating Body/Action Committee

A City of Diamond Bar Natural Hazards Mitigation Action Committee will be responsible for coordinating implementation of plan action items and undertaking the formal review process. The City Manager will assign representatives from City agencies, including, but not limited to, the current Natural Hazards Mitigation Planning Committee members. The City has formed a Natural Hazards Mitigation Planning Committee that consists of members from local agencies, organizations, and citizens, and includes the following:

City of Diamond Bar City Manager's Office
City of Diamond Bar Community and Development Services Department
City of Diamond Bar Administrative Services Department
City of Diamond Bar Building and Safety Division
City of Diamond Bar Finance Division
City of Diamond Bar Planning Division
City of Diamond Bar Public Information Division
City of Diamond Bar Public Works Division
City of Diamond Bar Community Services Division
Los Angeles County Sheriff's Department
Los Angeles County Fire Department
Pomona Unified School District
Walnut Valley Unified School District

In order to make this committee as broad and useful as possible, the City Manager will engage other relevant organizations and agencies in hazards mitigation. The recommendations for adding to the Natural Hazards Mitigation Action Committee include:

An elected official
A representative from the Chamber of Commerce
An insurance company representative
Community Planning Organization representatives
Representation from professional organizations such as the Home Builders Association

The Natural Hazards Mitigation Action Committee will meet no less than quarterly. Meeting dates will be scheduled once the final Hazards Mitigation Action Committee has been established. These meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the mitigation plan.

**Coordinator**

The City Council will adopt the City of Diamond Bar Natural Hazards Mitigation Plan, and the Hazards Mitigation Action Committee will take responsibility for plan implementation. The City Manager/Administrator will serve as a convener to facilitate the Natural Hazards Mitigation Action Committee meetings, and will assign tasks such as updating and presenting the Plan to the members of the committee. Plan implementation and evaluation will be a shared responsibility among all of the Natural Hazards Action Committee Members.

**Implementation through Existing Programs**

City of Diamond Bar addresses statewide planning goals and legislative requirements through its General Plan, Capital Improvement Plans, and City Building and Safety Codes. The Natural Hazards Mitigation Plan provides a series of recommendations - many of which are closely related to the goals and objectives of existing planning programs. The City of Diamond Bar will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

The City of Diamond Bar Building and Safety Department is responsible for administering the Building & Safety Codes. In addition, the Natural Hazards Action Committee will work with other agencies at the state level to review, develop and ensure Building & Safety Codes that are adequate to mitigate or prevent damage by natural hazards. This is to ensure that life-safety criteria are met for new construction.

The goals and action items in the mitigation plan may be achieved through activities recommended in the City's Capital Improvement Plans (CIP). Various City departments develop CIP plans, and review them on an annual basis. Upon annual review of the CIPs, the Natural Hazards Mitigation Action Committee will work with the City departments to identify areas that the hazards mitigation plan action items are consistent with CIP planning goals and integrate them where appropriate.

Within six months of formal adoption of the mitigation plan, the recommendations related to Plan Maintenance as outlined in the previous paragraphs will be incorporated into the process of existing planning mechanisms at the City level. The meetings of the Natural Hazards Mitigation Action Committee will provide an opportunity for Committee members to report back on the

progress made on the integration of mitigation planning elements into City planning documents and procedures.

**Economic Analysis of Mitigation Projects**

FEMA's approaches to identify the costs and benefits associated with natural hazards mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis.

Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later.

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Given federal funding, the Natural Hazards Mitigation Action Committee will use a FEMA-approved benefit/cost analysis approach to identify and prioritize mitigation action items. For other projects and funding sources, the Natural Hazards Mitigation Action Committee will use other approaches to understand the costs and benefits of each action item and develop a prioritized list. For more information regarding economic analysis of mitigation action items, please see Appendix E of the Plan.

**Evaluating and Updating the Plan**

**Formal Review Process**

The City of Diamond Bar Natural Hazards Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and time line, and identifies the local agencies and organizations participating in plan evaluation. The convener or designee will be responsible for contacting the Natural Hazards Mitigation Action Committee members and organizing the annual meeting.

Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

The Committee will review the goals and action items to determine their relevance to changing situations in the city, as well as changes in State or Federal policy, and to ensure they are addressing current and expected conditions. The Committee will also review the risk assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The coordinating organizations responsible for the various action items will report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised.

The convener will assign the duty of updating the plan to one or more of the committee members. The designated committee members will have three months to make appropriate changes to the Plan before submitting it to the Natural Hazards Mitigation Action Committee members, and

presenting it to the City Council (or other authority). The Natural Hazards Mitigation Action Committee will also notify all holders of the City plan when changes have been made. Every five years the updated plan will be submitted to the State Hazard Mitigation Officer and the Federal Emergency Management Agency for review.

**Continued Public Involvement**

City of Diamond Bar is dedicated to involving the public directly in review and updates of the Natural Hazards Mitigation Plan. The Natural Hazards Mitigation Action Committee members are responsible for the annual review and update of the plan.

The public will also have the opportunity to provide feedback about the Plan. Copies of the Plan will be catalogued and kept at all of the appropriate agencies in the city. The existence and location of these copies will be publicized in the monthly city newsletter "Diamond Bar City News", which reaches every household in the city. The plan also includes the address and the phone number of the City Manager's office, responsible for keeping track of public comments on the Plan.

In addition, copies of the plan and any proposed changes will be posted on the City website. This site will also contain an email address and phone number to which people can direct their comments and concerns.

A public meeting will also be held after each annual evaluation or when deemed necessary by the Natural Hazards Mitigation Action Committee. The meeting will provide the public a forum for which they can express its concerns, opinions, or ideas about the Plan. The City Public Information Officer will be responsible for using City resources to publicize the annual public meetings and maintain public involvement through the public access channel, web page, and newspapers.

# Part II: Specific Natural Hazards

## SECTION 6: EARTHQUAKES

Earthquakes are a serious hazard in almost every state in America. The most recent significant earthquake event affecting Southern California was the January 17, 1994 Northridge Earthquake. At 4:31 A.M. on Monday, January 17th, a moderate but very damaging earthquake with a magnitude 6.7 stuck the San Fernando Valley. In the following days and weeks, thousands of aftershocks occurred, causing additional damage to affected structures.

Fifty-seven people were killed and more than 1,500 people were seriously injured. For days afterward, thousands of homes and businesses were without electricity; tens of thousands had no gas; and nearly 50,000 had little or no water. Approximately 15,000 structures were moderately to severely damaged, which left thousands of people temporarily homeless. Sixty-six thousand five hundred buildings were inspected. Nearly 4,000 were severely damaged and over 11,000 were moderately damaged. Several collapsed bridges and overpasses created commuter havoc on the freeway system. Extensive damage was caused by ground shaking, but earthquake triggered liquefaction and dozens of fires also caused additional severe damage. This extremely strong ground motion in large portions of Los Angeles County resulted in record economic losses.

However, the earthquake occurred early in the morning on a holiday. This circumstance considerably reduced the potential effects. Many collapsed buildings were unoccupied, and most businesses were not yet open. The direct and indirect economic losses ran into the 10's of billions of dollars.

### What is an Earthquake?

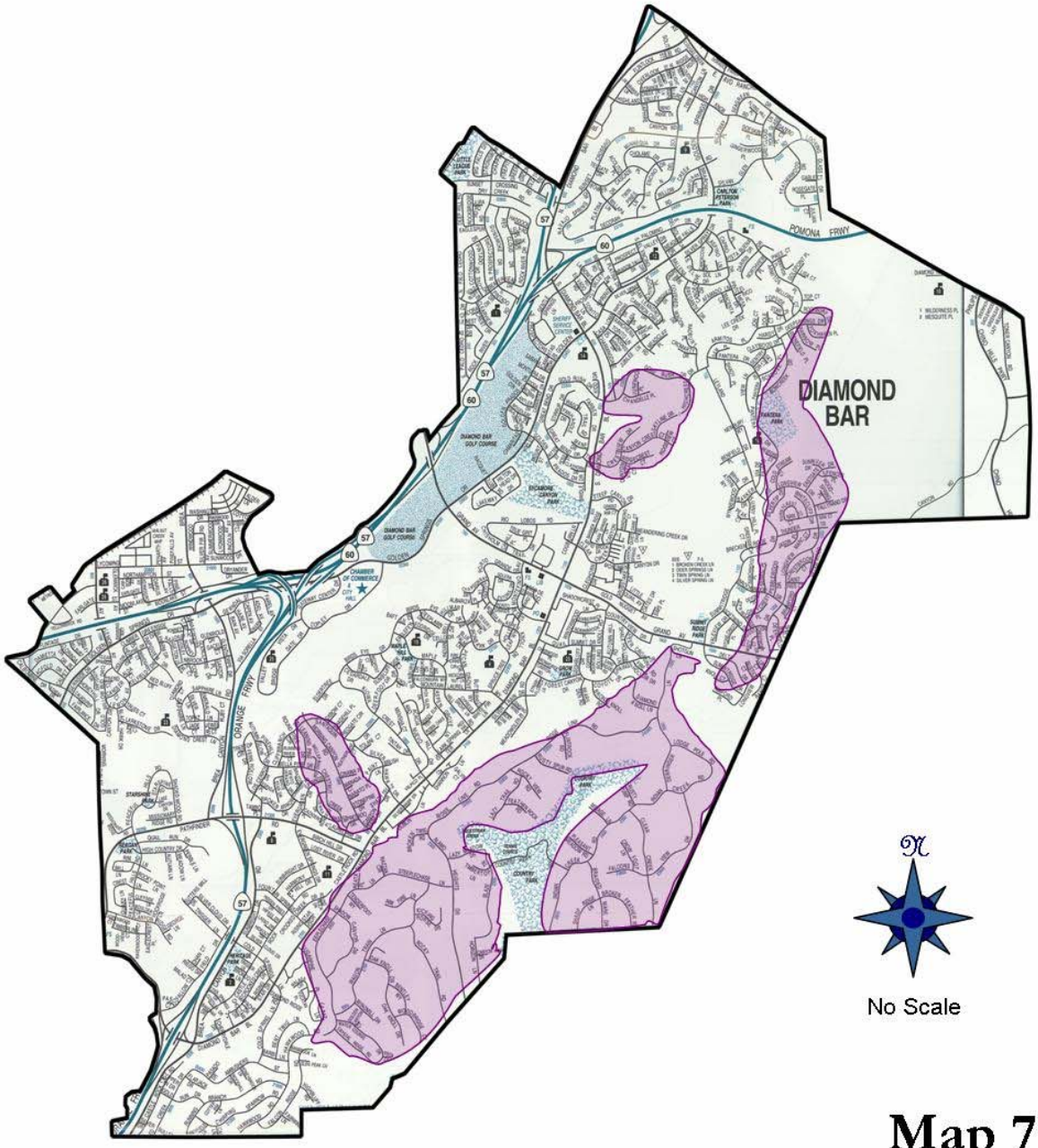
An earthquake is defined as a shaking or trembling of the earth that is volcanic or tectonic in origin. Earthquake is a term used to describe both sudden slip on a fault and the resulting and radiated seismic energy caused by the slip or by volcanic or magmatic activity or other sudden stress changes in the earth.

Earthquake Hazards – Earthquake hazard is anything associated with an earthquake that may affect the normal activities of people. This includes surface faulting, ground shaking, landslides, liquefaction, tectonic deformation, tsunamis and seiches.

Earthquake Risk – Earthquake risk is the probable building damage and number of people that are expected to be hurt or killed if a likely earthquake on a particular fault occurs. Earthquake risk and earthquake hazard are occasionally incorrectly used interchangeably.

(Source: U.S. Department of the Interior, U. S. Geological Survey, Earthquake Hazards Program, URL: http://earthquake.usgs.gov/image_glossary/)

Although earthquakes are a natural occurrence, human impacts can substantially affect the potential for earthquake failures in the City of Diamond Bar. Proper planning and geotechnical engineering can be exercised to reduce the threat of safety of people, property, and infrastructure.




# Map 7
# Earthquake Hazard Map

LEGEND

Potential Earthquake Hazard

Golf Course and Park Areas

**Regional Faults:**
Southern California and Diamond Bar rest upon the Pacific Plate, which is moving northward past the adjacent North American Plate at a rate of a few inches per year. The pressure caused by these moving plates creates tremendous strain in the earth's crust. The pressure between the Pacific and North American Plates has formed the San Andreas Fault Zone. At its closest point, the San Andreas Fault Zone is located 25 miles northeast of the City of Diamond Bar. The strain in this and other local fault zones is periodically released by sudden movements of the earth, which are called earthquakes.

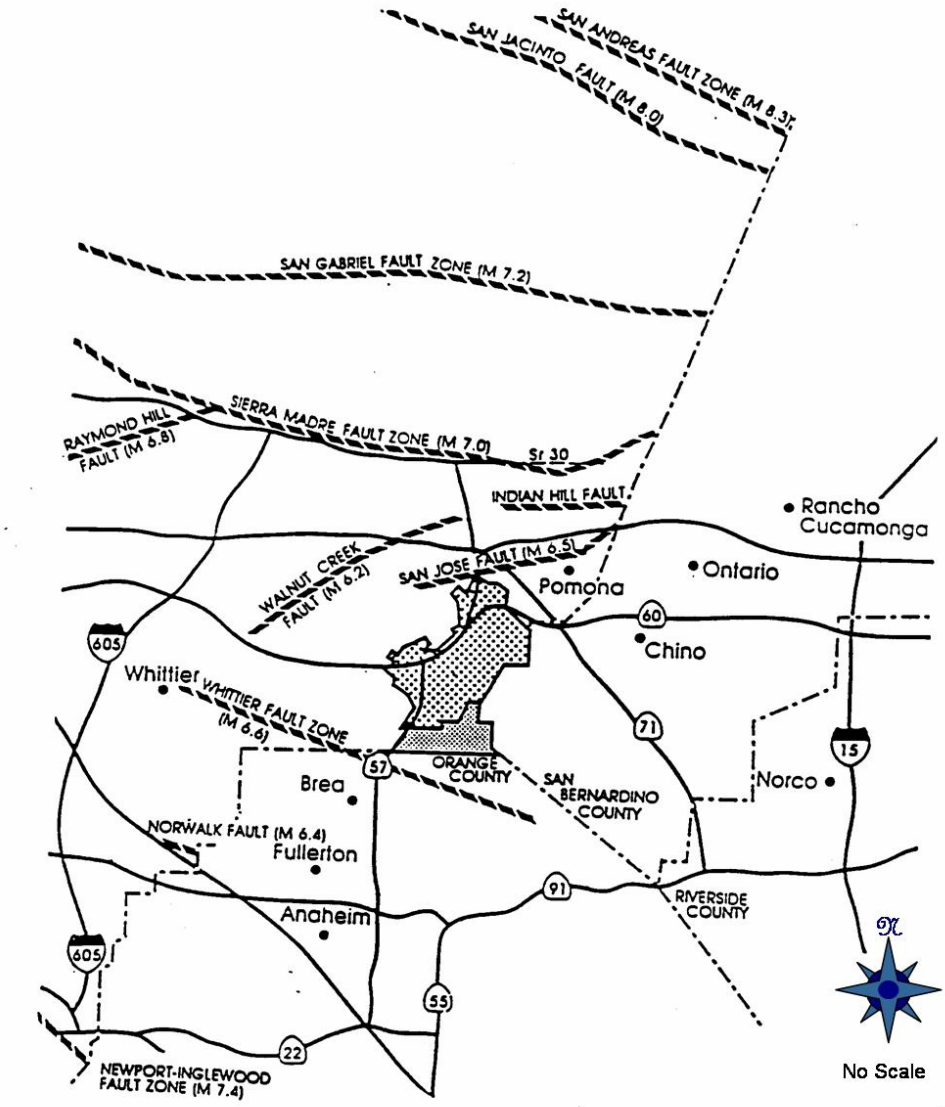
The Los Angeles Basin is crisscrossed by numerous regional earthquake faults, which divide it into smaller geologic "blocks". Diamond Bar is located near the southern border of the Northeastern Block. The southern border of this block is defined by the Whittier Fault, just south of the City's sphere of influence (Tonner Canyon). The San Gabriel Mountains and the active San Andreas and Cucamonga faults form the northern border of the block, while the Puente Hills and the potentially active Chino fault border it to the east. The term "active" refers to faults that have moved during Holocene time (about the last 11,000 years), while potentially active" refers to faults that have not moved during Holocene time, but have not been active during Quaternary time (11,000 to 3,000,000 years). "Inactive" faults are those which have not demonstrated movement within Quaternary time.

The Northeastern Block contains six active regional faults: the San Andreas, Newport-Inglewood, Reymond Hill, San Fernando, Whittier and Norwalk Faults. It also contains seven [potentially active faults: the San Gabriel, Santa Monica, Sierra Madre, San Jose, Malibu Coast, Verdugo and Walnut Creek Faults. Of these, only the nearby Whittier Fault Zone has been mapped in the immediate vicinity of the City; in Tonner Canyon near the 57 Freeway, immediately south of the City's sphere of influence (See Regional Map - Map 8 and Southern Califronia Earthquake Fault Map – Map 9).

**Seismic Study Zones:**
To minimize human injury and structural damage from active and potentially active faults, the State of California has adopted the Alquist-Priolo Special Studies Zones Act. Signed into the law on December 22, 1972 and effective March 7, 1973, this act required the State Geologist to map "Special Studies Zones" along the State's active and potentially active faults. Prior to approval of structures for occupancy within these zones, a geologic study must be undertaken to determine the precise location and necessary setbacks from identified faults. In addition, individual cities and counties can establish special or hazard management zones for faults that may not qualify as significant at the State level, but which may still represent a local seismic concern.

At present, no portion of the City of Diamond Bar is located within any special seismic study or hazard zone, as defined by the State Geologist (CDMG 1988). The active Whittier Fault Zone is located along the south ridge of Tonner Canyon, but no portion of the zone is within the City's present sphere of influence. Therefore, the potential for surface rupture within the City due to movement of the Whittier Fault is considered slight. (CDMG 1980).

In the adjacent Perris Block, the potentially active Chino Fault has also been identified near the City of Diamond Bar. It is generally located along the base on the Chino Hills, as defined by State Route 71. This regional fault joins with the Whittier Fault near Prado Dam in Corona.




# Map 8
# Regional Earthquake Faults Map

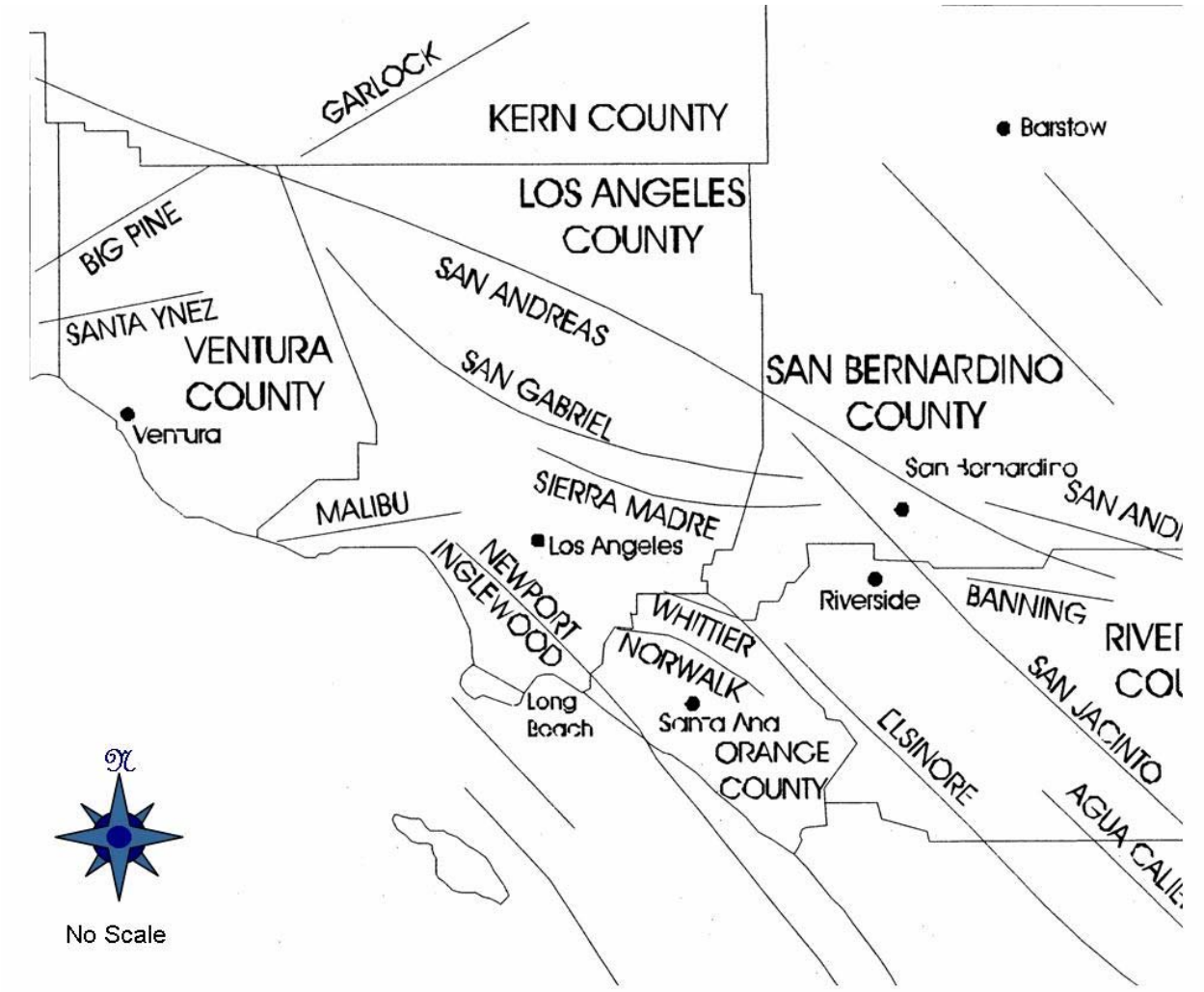
LEGEND

City of Diamond Bar

M Richer Magnitude

Fault Location (Approximate)

Source: City of Diamond Bar—General Plan




# Map 9
# Southern California Earthquake Fault Map

LEGEND

——— Major Faults

——— Inferred Faults or Offshore Escarpments

Together, they proceed southeast as the Whittier-Elsinore Fault. At the closest point as which it has been accurately mapped, the Chino Fault is approximately five miles east of the eastern border of the City. However, if the inferred location of the fault is extended based on its existing location and alignment, it could pass within one mile east of the Tres Hermanos area.

**Local Faults**

Diamond Bar is on the northern or "uptown" side of the Whittier Fault, which is broken by several localized faults. The Diamond Bar and the Arnold faults (which are currently identified as "INACTIVE") are located within the City boundaries. The last movement along these two faults was probably some time during the Miocene period (11-25 million years ago). In addition, these local faults have various folded strata (synclines and anticlines) associated with their structure. These folds create additional stress in the underlying bedrock formations and overlaying soil units, which further contributes to the unstable condition of the local slopes. The City of Diamond Bar is in seismic zones 3 and 4.

Recent earthquakes affecting the City are the 1998 Northridge quake, which resulted in many strict changes to California Building Codes, and the 1987 Whittier quake or whose origin is located 5 miles northwest of the City.

## HISTORIC SOUTHERN CALIFORNIA EARTHQUAKES

Historical and geological records show that California has a long history of seismic events. The earliest reported earthquake in Los Angeles was felt in 1769 by the exploring expedition of Gaspar de Portola while the group was camping about 48 kilometers (30 miles) southeast of Los Angeles.

Southern California is probably best known for the San Andreas Fault, a 400 mile long fault running form the Mexican border to a point offshore, west of San Francisco. "Geologic studies show that over the past 1,400 to 1,500 years large earthquakes have occurred at about 130 year intervals on the southern San Andreas Fault. As the last large earthquake on the southern San Andreas Fault occurred in 1857, that section of the fault is considered a likely location for an earthquake with the next few decades." 1

But San Andreas is only one of dozens of known earthquake faults that criss-cross Southern California. Some of the better known faults include the Newport-Inglewood, Whittier, Chatsworth, Elsinore, Hollywood, Los Alamitos and Palos Verdes faults. Beyond the known faults, there are a potentially large number of "blind" faults that underlie the surface of Southern California. One such blind fault was involved in the Whittier Narrows earthquake of October 1987.

Although the most famous of the faults, the San Andreas, is capable of producing an earthquake with a magnitude of 8+ on the Richter scale, some of the "lesser" faults have the potential to inflict greater damage on the urban core of the Los Angeles Basin. Seismologists believe that a 6.0 earthquake on the Newport-Inglewood fault would result in far more death and destruction than a "great" quake on the San Andreas, because the San Andreas is relatively remote from the urban centers of Southern California.

As a result of the magnitude 6.6 Northridge, California, earthquake, more than 11,000

earthquakes occurred over an area of 10,000 km2. Most were in the Santa Susana Mountains and in mountains north of the Santa Clara River Valley. The earthquakes destroyed dozens of homes, blocked roads, and damaged oil-field infrastructure. Caused deaths from Coccidioidomycosis (valley fever) the spore of which was released from the soil and blown toward the coastal populated areas. The spore was released from the soil by the earthquake activity.

Historically, Southern California has been seismically active. The San Andreas Fault is considered the most significant earthquake threat in California (in terms of overall magnitude), and has been the source of numerous significant earthquakes in the past. In 1857, an 8 + magnitude earthquake occurred at Fort Tejon near Los Angeles and an 8 + earthquake almost destroyed San Francisco in 1906. Both of these events were caused by movement along the San Andreas Fault. Major events (M 8 +) on this fault have a recurrence interval of 50-300 years with an average of 160 years between occurrences. Since the last major earthquake on the San Andreas was in San Francisco in 1906, we are well into the "window of opportunity" for another major earthquake on this fault. In addition, scientists have generally identified the portion of the fault in the Southern California region as having the most likelihood for a major event. (CDMG 1982)

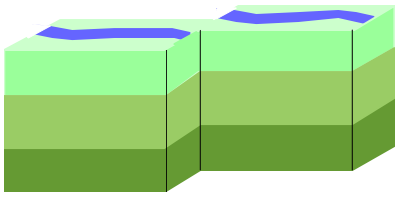
Diamond Bar does not have an historic record of any earthquakes having an epicenter within the City limits or its sphere of influence, and no significant movement has ever been recorded for any of the minor faults traversing the City. (LADCE 1980)

To better understand the earthquake hazard, the scientific community has looked at historical records and accelerated research on those faults that are the sources of the earthquakes occurring in the Southern California region. Historical earthquake records can generally be divided into records of the pre-instrumental period and the instrumental period. In the absence of instrumentation, the detection earthquakes are based on observations and felt reports, and are dependent upon population density and distribution. Since California was sparsely populated in the 1800s, the detection of pre-instrumental earthquakes is relatively difficult. However, two very large earthquakes, the Fort Tejon in 1857 (7.9) and the Owens Valley in 1872 (7.6) are evidence of the tremendously damaging potential of earthquakes in Southern California. In more recent times two 7.3 earthquakes struck Southern California, in Kern County (1952) and Landers (1992). The damage from these four large earthquakes was limited because the occurred in areas which were sparsely populated at the time they happened. The seismic risk is much more severe today than in the past because the population at risk is in the millions, rather than a few hundred or a few thousand persons.

Since seismologists started recording and measuring earthquakes, there have been tens of thousands of recorded earthquakes in Southern California, most with a magnitude below three. No community in Southern California is beyond the reach of a damaging earthquake. Table 6-1 describes the historical earthquake events that have affected Southern California.

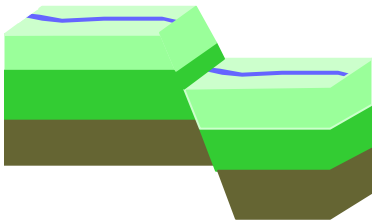
**Causes and Characteristics of Earthquakes in Southern California Earthquake Faults**

A fault is a fracture along between blocks of the earth's crust where either side moves relative to the other along a parallel plane to the fracture.



**Strike-slip**

Strike-slip faults are vertical or almost vertical rifts where the earth's plates move mostly horizontally. From the observer's perspective, if the opposite block looking across the fault moves to the right, the slip style is called a right lateral fault; if the block moves left, the shift is called a left lateral fault.



**Dip-slip**

Dip-slip faults are slanted fractures where the blocks mostly shift vertically. If the earth above an inclined fault moves down, the fault is called a normal fault, but when the rock above the fault moves up, the fault is called a reverse fault. Thrust faults have a reverse fault with a dip of 45 ° or less.

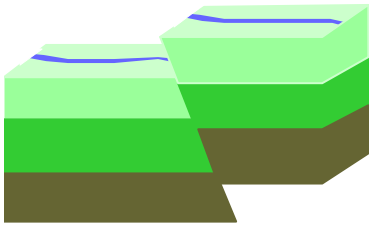


Table 6-1: Earthquake Events In the Southern California Region

| Southern California Region Earthquakes with a Magnitude 5.0 or Greater | |
|---|---|
| 1769 Los Angeles Basin | 1916 Tejon Pass Region |
| 1800 San Diego Region | 1918 San Jacinto |
| 1812 Wrightwood | 1923 San Bernardino Region |
| 1812 Santa Barbara Channel | 1925 Santa Barbara |
| 1827 Los Angeles Region | 1933 Long Beach |
| 1855 Los Angeles Region | 1941 Carpenteria |
| 1857 Great Fort Tejon Earthquake | 1952 Kern County |
| 1858 San Bernardino Region | 1954 W. of Wheeler Ridge |
| 1862 San Diego Region | 1971 San Fernando |
| 1892 San Jacinto or Ellsinore Fault | 1973 Point Mugu |
| 1893 Pico Canyon | 1986 North Palm Springs |
| 1894 Lytle Creek Region | 1987 Whittier Narrows |
| 1894 E. of San Diego | 1992 Landers |
| 1899 Lytle Creek Region | 1992 Big Bear |
| 1899 San Jacinto and Hemet | 1994 Northridge |
| 1907 San Bernardino Region | 1999 Hector Mine |
| 1910 Glen Ivy Hot Springs | |

Source:
http://geology.about.com/gi/dynamic/offsite.htm?site=http%3A%2F%2Fpasadena.wr.usgs.gov%2Finfo%2Fcahist_eqs.html

Dr. Kerry Sieh of Cal Tech has investigated the San Andreas fault at Pallett Creek. "The record at Pallett Creek shows that rupture has recurred about every 130 years, on average, over the past 1500 years. But actual intervals have varied greatly, from less than 50 years to more than 300. The physical cause of such irregular recurrence remains unknown."[1] Damage from a great quake on the San Andreas would be widespread throughout Southern California.

**Earthquake Related Hazards**
Ground shaking, landslides, liquefaction, and amplification are the specific hazards associated with earthquakes. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude, and the type of earthquake. (See Map 10 for City of Diamond Bar Earthquake Slope Stability Hazards)

**Ground Shaking**
Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock.

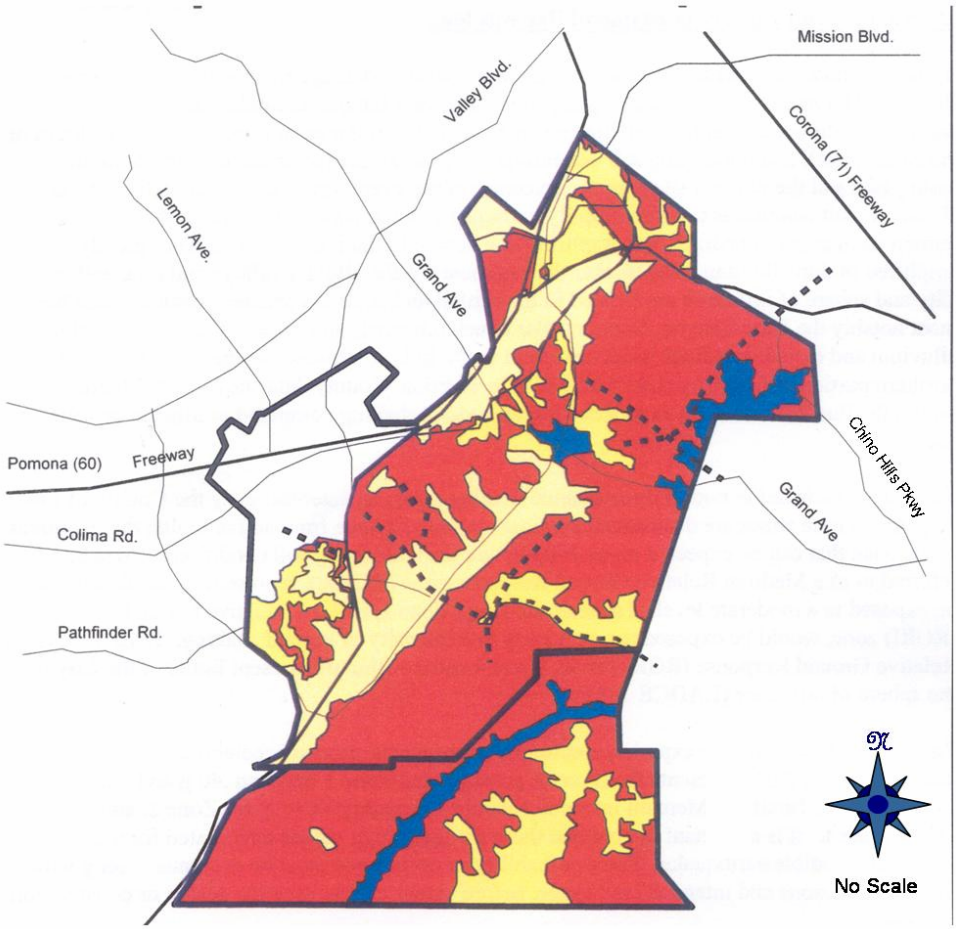
**Earthquake Induced Landslides**
Earthquake induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy the roads, buildings, utilities, and other critical facilities necessary to respond and recover from an earthquake. Many communities in Southern California have a high likelihood of encountering such risks, especially in areas with steep slopes.

**Liquefaction**
Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures. Many communities in Southern California are built on ancient river bottoms and have sandy soil. In some cases this ground may be subject to liquefaction, depending on the depth of the water table.

**Amplification**
Soils and soft sedimentary rocks near the earth's surface can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk.[2] Amplification can also occur in areas with deep sediment filled basins and on ridge tops.

## EARTHQUAKE HAZARD ASSESSMENT

**Primary Seismic Hazards**
The primary seismic hazards associated with earthquakes are ground rupture and ground shaking. Ground rupture, such as seismic fissures, refers to displacement of the ground along a




# Map 10
# Earthquake Slope Stability Hazards Map

LEGEND

- Moderate or Greater Slope Stability
- Moderately Low Slope Stability
- Very Low Slope Stability
- No Current Data Available for this Area
- Potential Liquefaction Zone
- Fault Trace

Source: City of Diamond Bar—General Plan

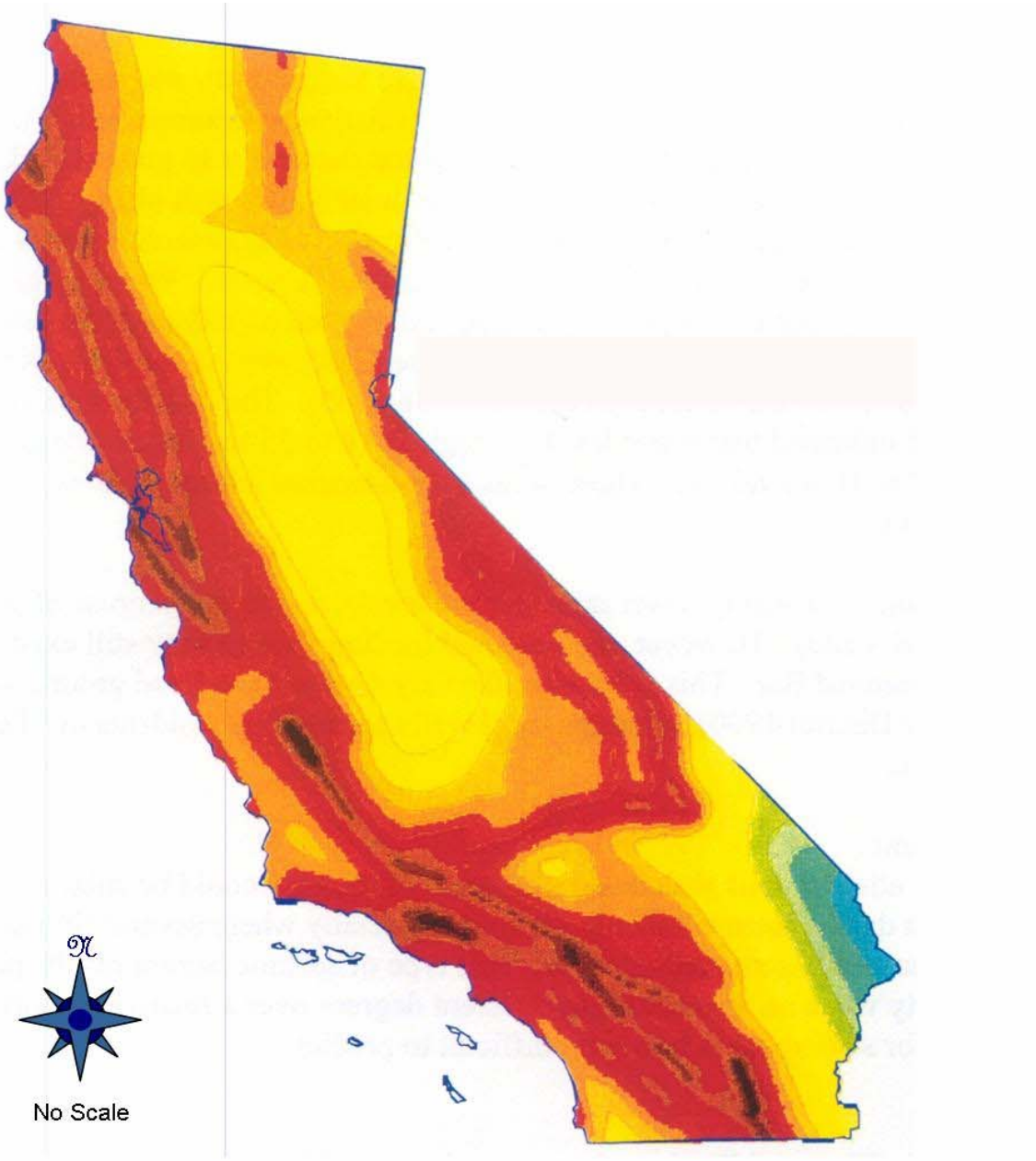
fault which can occur during strong earthquakes. The extent of rupture depends on the specific soil conditions and the severity of a particular seismic event. Such displacement may be vertical, horizontal or both and can be up to 20 feet or more in a major earthquake. Utilities, roads and other linear features are particularly vulnerable to damage as a result of ground rupture where they cross faults. The California Division of Mines and Geology analyzed potential major seismic activity in Southern California in a special report in 1982, and found that the possibility of actual ground rupture in Diamond Bar was low.

By far the most widespread effect and the greatest cause of damage in an earthquake is ground shaking. The intensity of this shaking depends on several factors, including the magnitude of the earthquake, distance from the earthquake epicenter (point of the earth directly above the focus of the earthquake), and underlying soil conditions. In general, the larger the magnitude of an earthquake and the closer a site is to the epicenter of the event, the greater will be the effects. However, soil conditions can also amplify earthquake shock waves. Generally, the shock waves remain unchanged in bedrock, are amplified to a degree in thick alluvium, and are greatly amplified in thin alluvium. The thicker the sediments of the alluvial valleys and fans within the City and sphere of influence are located in the central and southern drainage channels and basins, most notably the Brea Canyon, Diamond Bar Creek (channel) and Tonner Canyon. The thinner alluvium and exposed bedrock areas are found in the hills southwest, southeast, eastern and northern portions of the City (LADCE1980). In addition, County data shows that ridgelines within the Puente Formation experience higher ground shaking compared to hillside or valley locations.

The City is included in two of three seismic shaking zones as determined by the County of Los Angeles. These zones are determined by three factors: distance from active faults; the maximum earthquake that can be expected on each fault; and the underlying soil conditions. Zone 2, referred to as a Medium Relative Ground Response zone (RGRm), represents areas that would be exposed to a moderate level of seismic shaking. Zone 1, or Low Relative Ground response (RGRl) zone, would be exposed to a relatively low intensity of ground shaking. Zone 3, or High Relative Ground Response (RGRh) zone, is not located within the present limits of the City or the sphere of influence (LADCE 1980).

Zone 2 could theoretically experience earthquake producing ground accelerations in bedrock exceeding .50 g ("g" represents the force of gravity), and Zone 1 between .40 g and .50 g. Corresponding Modified Mercalli intensities would be roughly IX to X for Zone 2, and VIII to IX for Zone 1. It is important to note that these are maximum values anticipated for the maximum credible earthquake. Their probability of occurrence must be evaluated, along with the site conditions and intended land usage, before values can be used for design or construction purposes.

If a major earthquake were to occur, damage could be greater for stiff, relatively inflexible structures in low response areas (Zone 1), while tall structures in medium response areas (Zone 2) would also experience damage. The potential for damage is greatest, regardless of the shaking zone, to unreinforced masonry and frame structures not secured to their foundations, as well as poorly built structures.




# Map 11
# California Seismic Zones Map

LEGEND

Darker Shaded Areas Indicate Greater Potential Shaking

Source: USGS Website

**Secondary Seismic Hazards**
In addition to primary hazards, ground shaking can induce several kinds of secondary seismic hazards depending on the type of local soil conditions present. Secondary seismic hazards include liquefaction, differential settlement, landslides and seiching (Los Angeles County general Plan, 1988). In addition, ground shaking may also induce the threat of fire by damaging or destroying natural gas or electrical utility lines.

**Liquefaction**
The greatest danger from liquefaction occurs in areas where the ground water table is within 35 feet of ground level and the soil is poorly consolidated or relatively uncompacted. This condition is characterized by the sudden loss of shearing resistance due to ground shaking combined with an increase in poor water pressure. Subsequently, this will often result in collapse or displacement of building foundations. Identification of liquefaction zones is based primarily on the occurrence or groundwater in surficial alluvial deposits. Water in the east San Gabriel Valley is generally found at depths of 30 -200 feet at present, although the Los Angeles County General Plan did identify areas along San Jose Creek, adjacent to the City, as having groundwater within 30 feet of the surface (LACDRP 1988 p. 35). The EIR for the Community Plan prepared in 1982 indicated that water levels as high as 14 to 35 feet below the ground surface have occurred in Diamond Bar. These areas have historically been in Brea, Diamond Bar and Tonner canyons.

The regional water table is probably lower than historic levels, due to the overuse of groundwater in the East San Gabriel Valley. However, the potential for liquefaction may still exist along the stream channels in Diamond Bar.

**Differential Settlement**
The moderately thick alluvial soils which underlie some of the City could be subject to differential settlement during intense seismic shaking, especially where several fill materials have been used that have different settling rates. This type of seismic hazard results primarily in the damage to property when an area settles to different degrees over a relatively short distance. The actual potential for settlement is however, difficult to predict.

**Landslides**
Most of the hillsides in Diamond Bar have low to moderate 1987 potential for landslides. The stability of a slope is attributed to such factors as the soil type, gradient of the slope (greater than 25 percent particularly), underlying geologic structure, and local drainage patterns. The rolling topography and composition of the local soils throughout most of the City create numerous areas for potential landslide hazards. Although many historic landslide locations have since been stabilized through proper grading and development, there still exist a number of potential landslide areas along the eastern third of the City as well as in Tonner Canyon (sphere of influence).

**Seiching**
This phenomenon occurs when seismic ground shaking includes standing waves (seiches) inside of water retention facilities, such as reservoirs and water tanks. Such waves can cause the retention structures to fail and flood downstream properties. Seiching may be a potential hazard for areas in proximity to various reservoirs in the City.

**Explosion/Fire/Damage**
Significant ground shaking could cause explosions or fires in residential or non-residential areas by breaking natural gas and electrical lines.

**Soil Constraints**
Many of the soil types within Diamond Bar have certain building constraints, either alone or in conjunction with seismic shaking. These include soil creep, expansive soils, corrosive soils, and soil saturation.

**Soil Creep**
This situation occurs when local soils have low or poor bearing strength, and are overloaded with structures or improvements. Under the force of gravity, the overlying soil material occur on almost any hillside in the City in excess of 11 percent slope. This condition can be exacerbated by intense seismic shaking. Therefore, poorly consolidated soils with a tendency toward this condition could experience creep during earthquakes during earthquakes even on slopes less than 11 percent.

**Expansive Soils**
Expansive soils generally have a moderate to high clay content, and lose their cohesion when saturated under pressure. Almost all of the soils within Diamond Bar have the potential to be expansive (LACDE 1980). It should be noted that some expansive soils may have high water content, but may not demonstrate any visible characteristics of expansion. However, these soils may react to intense seismic shaking by an immediate loss of soil cohesion and subsequent failure (LADCE 1980).

**Corrosive Soils**
Certain soils contain or produce acidic or reducing materials that can lead to the corrosion of underground utility pipelines. Although this is not a general problem in Diamond Bar, the Los Angeles County General Plan noted that natural gas pipelines should be wrapped to prevent direct contact with such soils and prevent corrosion (LACDRP 1988).

**Saturation**
This is not an intrinsic soil condition per se, but some soils lose cohesion or compression strength when saturated by water. Saturation can occur naturally from rainfall, but is more often the result of overwatering by sprinklers, leaks from broken irrigation pipes or runoff misdirected by improper grading. Septic tanks can also cause this problem if they are installed incorrectly or are not large enough. Sewers eliminate leachate problems, but can also cause problems through leakage (Walnut Valley Water District 1990).

**Subsidence**
Extensive oil deposits exist due to the Whittier Fault Zone that passes through this area. The lower portion of Tonner Canyon, south of the City's sphere of influence, has been the site of oil

drilling for over 40 years. The removal of water or oil from underlying strata can sometimes cause ground surfaces to sink; this phenomenon is referred to as subsidence. There is no evidence of historical oil drilling within the sphere area, nor is there any active drilling at present. However, it is unknown if or to what degree slant drilling, or the drilling of wells at angles other than vertical, could be contacting oil reserves actually located under the sphere of influence. There is no evidence at present of subsidence in the sphere area due to oil extraction, although specific tests for this condition have not been conducted.

**Geology/Seismicity**

The principal fault most likely to produce earthquake damage in or near the City is the Whittier Fault, although a major temblor on either the San Andreas or Newport-Inglewood fault would have serious impacts on the entire region. The Whittier Fault Zone, as delineated by the Department of Mines and Geology for the Alquist-Priolo Act, is considered an active fault. Policies and criteria for dealing with seismic hazards were established to assist cities and counties, although the act states development within the City should be built to withstand the likely maximum amount of ground shaking anticipated in the area without loss of life.

**Unreinforced Masonry**

The 1933 Long Beach earthquake led to the first State and local laws requiring seismic resistance building designs. Building constructed prior to 1933 may offer little or no structural protection in a major earthquake.

The Uniform Building Code, a set of structural requirements for building construction and safety, did not require until 1952 that single family homes be bolted to their foundations. Other than unreinforced masonry structures, the only buildings covered by retroactive laws are public schools. The State has regulated school safety requirements since the Field Act was adopted after the 1933 Long Beach earthquake (Title 24, State Building Standards Commission, 1987).

Although buildings constructed after 1933 offer a somewhat greater degree of earthquake resistance, it was not until after the 1971 San Fernando earthquake that building code requirements became even more stringent. The building code was changed to require positive anchorage of wall panels to floor and roof diaphragms. These requirement, however, are not retroactive to existing buildings.

It is possible that one of the most serious seismic hazards in the City could be the presence of unreinforced masonry buildings. Although nearly all buildings in the City were built subsequent to the 1952 Building Code, there may be some buildings in the City that were not properly built, or have fallen into such disrepair, that they would not be safe in a major earthquake.

Unreinforced buildings may be subject to collapse or substantial destruction during a moderate to severe earthquake. The Unreinforced Masonry Building Act (1986) required cities and counties to prepare an “Inventory and Mitigation Plan” for all such buildings within their jurisdiction. It should be noted that according to the State Historical Preservation Commission, buildings that are designated as having local historical significance are exempt from standard seismic upgrade requirements. (SeeTable 6-2: Zone 4, Unreinforced Masonry Program).

(Insert Unreinforced Masonry Program Table)

**Sphere of Influence**
The City should carefully consider development in the sphere of influence in light of seismic limitations. Low density or open space uses would be appropriate. Overall access to the sphere area must also be an important consideration, especially if a major earthquake were to cut off primary access.

## EARTHQUAKE HAZARD ASSESSMENT

**Hazard Identification**
In California, many agencies are focused on seismic safety issues: the State's Seismic Safety Commission, the Applied Technology Council, Governor's Office of Emergency Services, United States Geological Survey, Cal Tech, the California Geological Survey as well as a number of universities and private foundations.

These organizations, in partnership with other state and federal agencies, have undertaken a rigorous program in California to identify seismic hazards and risks including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides. Seismic hazard maps have been published and are available for many communities in California through the State Division of Mines and Geology. The Fault Map illustrates the known earthquake faults in Southern California.

## VULNERABILITY AND RISK

Vulnerability assessment for earthquakes will assist in predicting how different types of property and population groups will be affected by a hazard. Data that includes specific earthquake-prone areas in the City can be used to assess the population and total value of property at risk from future earthquake occurrences.

While a quantitative vulnerability assessment (an assessment that describes number of lives or amount of property exposed to the hazard) has not yet been conducted for Diamond Bar earthquake events, there are many qualitative factors that point to potential vulnerability. Earthquakes can impact major transportation arteries, blocking residents from essential services and businesses.

Continuing to map City earthquake and debris flow areas will help in preventing future loss. Factors included in assessing earthquake risk include population and property distribution in the hazard area, the frequency of earthquake or debris flow occurrences, slope steepness, soil characteristics, and precipitation intensity. This type of analysis could generate estimates of the damages to the City due to a specific earthquake or debris flow event. At the time of publication of this plan, data was insufficient to conduct a risk analysis and the software needed to conduct this type of analysis was not available.

## Sierra Madre Fault

TYPE OF FAULTING: reverse
LENGTH: the zone is about 55 km long;
total length of main fault segments is about 75 km, with each segment measuring roughly 15 km long

NEARBY COMMUNITIES: Sunland, Altadena, Sierra Madre, Monrovia, Duarte, Glendora
MOST RECENT SURFACE RUPTURE: Holocene
SLIP RATE: between 0.36 and 4 mm/yr
INTERVAL BETWEEN SURFACE RUPTURES: several thousand years
PROBABLE MAGNITUDES: Magnitude 6.0 - 7.0

## San Jose Fault

TYPE OF FAULTING: left-lateral strike-slip; minor reverse component possible
LENGTH: about 18 km
NEARBY COMMUNITIES: Claremont, La Verne, Pomona
LAST SIGNIFICANT QUAKE: Feb 28, 1990: Magnitude 5.4
No surface rupture found
MOST RECENT SURFACE RUPTURE Late Quaternary
SLIP RATE: between 0.2 and 2.0 mm/yr
INTERVAL BETWEEN MAJOR RUPTURES: unknown
PROBABLE MAGNITUDES: Magnitude 6.0 - 6.5
OTHER NOTES: The San Jose fault dips steeply to the north.

## Whittier Fault

TYPE OF FAULTING: right-lateral strike-slip with some reverse slip
LENGTH: about 40 km
NEARBY COMMUNITIES: Yorba Linda, Hacienda Heights, Whittier
MOST RECENT SURFACE RUPTURE: Holocene
SLIP RATE: between 2.5 and 3.0 mm/yr
INTERVAL BETWEEN MAJOR RUPTURES: unknown
PROBABLE MAGNITUDES: Magnitude 6.0 - 7.2
OTHER NOTES: The Whittier fault dips toward the northeast.

## San Andreas Fault

TYPE OF FAULT: right-lateral strike-slip
LENGTH: 1200 km
550 km south from Parkfield; 650km northward
NEARBY COMMUNITY: Parkfield, Frazier Park, Palmdale, Wrightwood, San Bernardino, Banning, Indio
LAST MAJOR RUPTURE: January 9, 1857 (Mojave segment); April 18, 1906 (Northern segment)
SLIP RATE: about 20 to 35 mm per year
INTERVAL BETWEEN MAJOR RUPTURES: average of about 140 years on the Mojave segment;
recurrence interval varies greatly -- from under 20 years (at Parkfield only) to over 300 years
PROBABLE MAGNITUDES: Magnitude 6.8 - 8.0

In California, each earthquake is followed by revisions and improvements in the Building Codes. The 1933 Long Beach resulted in the Field Act, affecting school construction. The 1971 Sylmar earthquake brought another set of increased structural standards. Similar re-evaluations occurred after the 1989 Loma Prieta and 1994 Northridge earthquakes. These code changes have resulted in stronger and more earthquake resistant structures.

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. This state law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. Surface rupture is the most easily avoided seismic hazard.[3]

The Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.[4] The State Department of Conservation operates the Seismic Mapping Program for California. Extensive information is available at their website: http://gmw.consrv.ca.gov/shmp/index.htm

**Vulnerability Assessment**

The effects of earthquakes span a large area, and large earthquakes occurring in many parts of the Southern California region would probably be felt throughout the region. However, the degree to which the earthquakes are felt, and the damages associated with them may vary. At risk from earthquake damage are large stocks of old buildings and bridges: many high tech and hazardous materials facilities: extensive sewer, water, and natural gas pipelines; earth dams; petroleum pipelines; and other critical facilities and private property located in the county. The relative or secondary earthquake hazards, which are liquefaction, ground shaking, amplification, and earthquake-induced landslides, can be just as devastating as the earthquake.

The California Geological Survey has identified areas most vulnerable to liquefaction. Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these buildings and structures.

Southern California has many active landslide areas, and a large earthquake could trigger accelerated movement in these slide areas, in addition to jarring loose other unknown areas of landslide risk.

**Risk Analysis**

Risk analysis is the third phase of a hazard assessment. Risk analysis involves estimating the damage and costs likely to be experienced in a geographic area over a period of time[5] . Factors included in assessing earthquake risk include population and property distribution in the hazard area, the frequency of earthquake events, landslide susceptibility, buildings, infrastructure, and disaster preparedness of the region. This type of analysis can generate estimates of the damages to the region due to an earthquake event in a specific location. FEMA's software program, HAZUS, uses mathematical formulas and information about building stock, local geology and the location and size of potential earthquakes, economic data, and other information to estimate losses from a potential earthquake.[6] The HAZUS software is available from FEMA at no cost.

For greater Southern California there are multiple worst case scenarios, depending on which fault might rupture, and which communities are in proximity to the fault. But damage will not necessarily be limited to immediately adjoining communities. Depending on the hypocenter of the earthquake, seismic waves may be transmitted through the ground to unsuspecting

communities. In the Northridge 1994 earthquake, Santa Monica suffered extensive damage, even though there was a range of mountains between it and the origin of the earthquake.

Damages for a large earthquake almost anywhere in Southern California are likely to run into the billions of dollars. Although building codes are some of the most stringent in the world, ten's of thousands of older existing buildings were built under much less rigid codes. California has laws affecting unreinforced masonry buildings (URM's) and although many building owners have retrofitted their buildings, hundreds of pre-1933 buildings still have not been brought up to current standards. The City of Diamond Bar has no unreinforced masonry buildings.

Non-structural bracing of equipment and contents is often the most cost-effective type of seismic mitigation. Inexpensive bracing and anchoring may be the most cost effective way to protect expensive equipment. Non-structural bracing of equipment and furnishings will also reduce the chance of injury for the occupants of a building.

**Extent**
Earthquakes in the previously mentioned and described regional faults could reach as high as 7.2 on the Richter Scale.

## COMMUNITY EARTHQUAKE ISSUES

**What is Susceptible to Earthquakes?**
Earthquake damage occurs because humans have built structures that cannot withstand severe shaking. Buildings, airports, schools, and lifelines (highways and utility lines) suffer damage in earthquakes and can cause death or injury to humans. The welfare of homes, major businesses, and public infrastructure is very important. Addressing the reliability of buildings, critical facilities, and infrastructure, and understanding the potential costs to government, businesses, and individuals as a result of an earthquake, are challenges faced by the city.

**Dams**
There are a total of 103 dams in Los Angeles County, owned by 23 agencies or organizations, ranging from the Federal government to Home Owner Associations.[7] These dams hold billions of gallons of water in reservoirs. Releases of water from the major reservoirs are designed to protect Southern California from flood waters and to store domestic water. Seismic activity can compromise the dam structures, and the resultant flooding could cause catastrophic flooding. Following the 1971 Sylmar earthquake the Lower Van Norman Dam showed signs of structural compromise, and tens of thousands of persons had to be evacuated until the dam could be drained. The dam has never been refilled.

**Infrastructure and Communication**
Residents in the City of Diamond Bar commute frequently by automobiles and public transportation such as buses and light rail. An earthquake can greatly damage bridges and roads, hampering emergency response efforts and the normal movement of people and goods. Damaged infrastructure strongly affects the economy of the community because it disconnects people from work, school, food, and leisure, and separates businesses from their customers and suppliers,

**Damage to Lifelines**

Lifelines are the connections between communities and outside services. They include water and gas lines, transportation systems, and electricity and communication networks. Ground shaking and amplification can cause pipes to break open, power lines to fall, roads and railways to crack or move, and radio and telephone communication to cease. Disruption to transportation makes it especially difficult to bring in supplies or services. Lifelines need to be usable after earthquake to allow for rescue, recovery, and rebuilding efforts and to relay important information to the public.

**Disruption of Critical Services**
Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the community. These facilities and their services need to be functional after an earthquake event. Currently there are no critical facilities in the City of Diamond Bar that were built prior to 1965.

**Businesses**
Seismic activity can cause great loss to businesses, both large-scale corporations and small retail shops. When a company is forced to stop production for just a day, the economic loss can be tremendous, especially when its market is at a national or global level. Seismic activity can create economic loss that presents a burden to large and small shop owners who may have difficulty recovering from their losses.

> Forty percent of businesses do not reopen after a disaster and another twenty-five percent fail within one year according to the Federal Emergency Management Agency (FEMA). Similar statistics from the United States Small Business Administration indicate that over ninety percent of businesses fail within two years after being struck by a disaster.[8]

**Individual Preparedness**
Because the potential for earthquake occurrences and earthquake related property damage is relatively moderate in the City of City of Diamond Bar, increasing individual preparedness is a significant need. Strapping down heavy furniture, water heaters, and expensive personal property, as well as being earthquake insured, and anchoring buildings to foundations are just a few steps individuals can take to prepare for an earthquake.

**Death and Injury**
Death and injury can occur both inside and outside of buildings due to collapsed buildings falling equipment, furniture, debris, and structural materials. Downed power lines and broken water and gas lines can also endanger human life.

**Fire**
Downed power lines or broken gas mains can trigger fires. When fire stations suffer building or lifeline damage, quick response to extinguish fires is less likely. Furthermore, major incidents will demand a larger share of resources, and initially smaller fires and problems will receive little or insufficient resources in the initial hours after a major earthquake event. Loss of electricity may cause a loss of water pressure in some communities, further hampering fire fighting ability.

**Debris**

After damage to a variety of structures, much time is spent cleaning up brick, glass, wood, steel or concrete building elements, office and home contents, and other materials. Developing strong debris management strategies is essential in post-disaster recovery. Occurrence of a disaster does not exempt the City of Diamond Bar from compliance with AB 939 regulations.

**Existing Mitigation Activities**
Existing mitigation activities include current mitigation programs and activities that are being implemented by county, regional, state, or federal agencies or organizations.

**City of Diamond Bar Codes**
Implementation of earthquake mitigation policy most often takes place at the local government level. The City of City of Diamond Bar Department of Building and Safety enforces building codes pertaining to earthquake hazards.

## COMMUNITY EARTHQUAKE ISSUES

**What is Susceptible to Earthquakes?**
Earthquakes can affect utility services, transportation systems, and critical lifelines. Communities may suffer immediate damages and loss of service. Disruption of infrastructure, roads, and critical facilities may also have a long-term effect on the economy. Utilities, including potable water, wastewater, telecommunications, natural gas, and electric power are all essential to service community needs. Loss of electricity has the most widespread impact on other utilities and on the whole community. Natural gas pipes may also be at risk of breakage from earthquake movements as small as an inch or two.

## ROADS AND BRIDGES

**Buildings**
The built environment is susceptible to damage from earthquakes. Buildings that collapse can trap and bury people. Lives are at risk and the cost to clean up the damages is great. In most California communities, however, construction of homes and buildings in the City of Diamond Bar did not begin until to early 1960’s; many buildings were built before 1993 when building codes were not as strict. In addition, retrofitting is not required except under certain conditions and can be expensive. Therefore, the number of buildings at risk remains moderate. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of unreinforced masonry buildings (of which Diamond Bar has none).

**Bridge Damage**
Even modern bridges can sustain damage during earthquakes, leaving them unsafe for use; some bridges have failed completely due to strong ground motion. Bridges are a vital transportation link - with even minor damages making some areas inaccessible. Because bridges vary in size, materials, location and design, any given earthquake will affect them differently. Bridges built before the mid-1970' s have a significantly higher risk of suffering structural damage during a moderate to large earthquake compared with those built after 1980 when design improvements were made.

Much of the interstate highway system was built in the mid to late 1960's. The bridges in the City of Diamond Bar are state, county or privately owned (including railroad bridges). Cal Trans has retrofitted most bridges on the freeway system; however there are still some county maintained bridges that are not retrofitted. The FHWA requires that bridges on the National Bridge Inventory be inspected every 2 years. Cal Trans inspects the bridges because they administer the Federal funds for bridge projects.

## LIFELINES AND CRITICAL FACILITIES

Lifelines and critical facilities should remain accessible, if possible, during a natural hazard event. The impact of closed transportation arteries may be increased if the closed road or bridge is the access for hospitals and other emergency facilities. Therefore, inspection and repair of critical transportation facilities and routes is essential and should receive high priority. Losses of power and phone service are also potential consequences of earthquake events. Due to heavy rains, soil erosion in hillside areas can be accelerated, resulting in loss of soil support beneath high voltage transmission towers in hillsides and remote areas. Flood events can also cause earthquakes, which can have serious impacts on gas lines that are located in vulnerable soils.

## EARTHQUAKE MITIGATION ACTIVITIES

Earthquake mitigation activities include current mitigation programs and activities that are being implemented by local or city organizations.

Earthquake Building/Zoning Codes:
Due to the knowledge acquired by designers and code administrators during the period following the 1998 Northridge earthquake, the following changes were made to the Building Code:

- Structural member values have been reduced, which means that larger framing and structural members are to be used.
- Strict design criteria are mandated for both commercial and residential structures.
- Other changes include penetration through firewalls, flame barriers, parapet construction, labels for fire doors, sprinklers requirements for “M” occupancies, means of egress and exit travel requirements through intervening rooms.
- Attic and laundry ventilation.
- Design loads for patio covers.
- Anchorage of concrete or masonry walls in seismic zone 3 and 4.
- Prescriptive sill bolting requirements for seismic zone 3 and 4 has been increased.

Amendments to the California Building Code adopted by the City of Diamond Bar in 2002.

- All authority and duties usually exercised by the Building Official on all items dealing with excavation and grading have been given to the City Engineer. This amendment is proposed due to the complexity of the submitted grading plans and the diverse topography in the City. Dealing with this type of challenge requires the expertise of a civil engineer that is accustomed in addressing these issues

### Earthquake Mitigation Action Items

The Earthquake mitigation action items provide direction on specific activities that the City, organizations, and residents in City of Diamond Bar can undertake to reduce risk and prevent loss from Earthquake events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

**Code Sections**

The City of Diamond Bar has adopted the California Building Code which amends the Uniform Building Code. The City also has amended the 2001 Building Code which was affected in October of 2002.

The following sections of the CBC address the earthquake hazard:

1605, 1 (Distribution of Horizontal Sheer); 1605A.2.1
1605. 2 (Stability against Overturning); 1605A.2.2
1626 (Seismic); 1626.A.1
1605. 3 (Anchorage); and 1605A.2.3
1632, 1633, 1633. 9 deal with specific earthquake hazards.

Generally, these codes seek to discourage development in areas that could be prone to flooding, landslide, wildfire and / or seismic hazards; and where development is permitted, that the applicable construction standards are met. Developers in hazard-prone areas may be required to retain a qualified professional engineer to evaluate level of risk on the site and recommend appropriate mitigation measures.

**Coordination Among Building Officials**

The City of Diamond Bar Building Code sets the minimum design and construction standards for new buildings. In 2001, the City of Diamond Bar adopted the most recent seismic standards in its building code, which requires that new buildings be built at a higher seismic standard.

Since 1989, the City of Diamond Bar also requires that site-specific seismic hazard investigations be performed for new essential facilities, major structures, hazardous facilities, and special occupancy structures such as emergency response facilities.

**Businesses/Private Sector**

Natural hazards have a devastating impact on businesses. In fact, of all businesses which close following a disaster, more than forty-three percent never reopen, and an additional twenty-nine percent close for good within the next two years.[9] The Institute of Business and Home Safety has developed “Open for Business”, which is a disaster planning toolkit to help guide businesses in preparing for and dealing with the adverse affects natural hazards. The kit integrates protection from natural disasters into the company's risk reduction measures to safeguard employees, customers, and the investment itself. The guide helps businesses secure human and physical resources during disasters, and helps to develop strategies to maintain business continuity before, during, and after a disaster occurs.

**Hospitals**

The Alfred E. Alquist Hospital Seismic Safety Act ("Hospital Act") was enacted in 1973 in response to the moderate Magnitude 6.6 Sylmar Earthquake in 1971 when four major hospital campuses were severely damaged and evacuated. Two hospital buildings collapsed killing forty seven people. Three others were killed in another hospital that nearly collapsed.

In approving the Act, the Legislature noted that:

- Hospitals, that house patients who have less than the capacity of normally healthy persons to protect themselves, and that must be reasonably capable of providing services to the public after a disaster, shall be designed and constructed to resist, insofar as practical, the forces generated by earthquakes, gravity and winds. (Health and Safety Code Section 129680)

- When the Hospital Act was passed in 1973, the State anticipated that, based on the regular and timely replacement of aging hospital facilities, the majority of hospital buildings would be in compliance with the Act's standards within 25 years. However, hospital buildings were not, and are not, being replaced at that anticipated rate. In fact, the great majority of the State's urgent care facilities are now more than 40 years old.

- The moderate Magnitude 6.7 Northridge Earthquake in 1994 caused $3 billion in hospital-related damage and evacuations. Twelve hospital buildings constructed before the Act were cited (red tagged) as unsafe for occupancy after the earthquake. Those hospitals that had been built in accordance with the 1973 Hospital Act were very successful in resisting structural damage. However, nonstructural damage (for example, plumbing and ceiling systems) was still extensive in those post-1973 buildings

- Senate Bill 1953 ("SB 1953"), enacted in 1994 after the Northridge Earthquake, expanded the scope of the 1973 Hospital Act. Under SB 1953, all hospitals are required, as of January 1, 2008, to survive earthquakes without collapsing or posing the threat of significant loss of life. The 1994 Act further mandates that all existing hospitals be seismically evaluated, and retrofitted, if needed, by 2030, so that they are in substantial compliance with the Act (which requires that the hospital buildings be reasonably capable of providing services to the public after disasters). SB 1953 applies to all urgent care facilities (including those built prior to the 1973 Hospital Act) and affects approximately 2,500 buildings on 475 campuses.

- SB 1953 directed the Office of Statewide Health Planning and Development ("OSHPD"), in consultation with the Hospital Building Safety Board, to develop emergency regulations including "…earthquake performance categories with subgradations for risk to life, structural soundness, building contents, and nonstructural systems that are critical to providing basic services to hospital inpatients and the public after a disaster." (Health and Safety Code Section 130005)

The Seismic Safety Commission Evaluation of the State's Hospital Seismic Safety Policies

- In 2001, recognizing the continuing need to assess the adequacy of policies, and the application of advances in technical knowledge and understanding, the California Seismic Safety Commission created an Ad Hoc Committee to re-examine the compliance with the Alquist Hospital Seismic Safety Act. The formation of the Committee was also prompted by the recent evaluations of hospital buildings reported to OSHPD that revealed that a large percentage (40%) of California's operating hospitals are in the highest category of collapse risk.[10]

**California Earthquake Mitigation Legislation**

California is painfully aware of the threats it faces from earthquakes. Dating back to the 19th century, Californians have been killed, injured, and lost property as a result of earthquakes. As the State's population continues to grow, and urban areas become even more densely built up, the risk will continue to increase. For decades the Legislature has passed laws to strengthen the built environment and protect the citizens. Table 6-3 provides a sampling of some of the 200 plus laws in the State's codes.

Table 6-3: Partial List of Over 200 California Laws on Earthquake Safety

| | |
|---|---|
| Government Code Section 8870-8870.95 | Creates Seismic Safety Commission. |
| Government Code Section 8876.1-8876.10 | Established the California Center for Earthquake Engineering Research. |
| Public Resources Code Section 2800-2804.6 | Authorized a prototype earthquake prediction system along the central San Andreas fault near the City of Parkfield. |
| Public Resources Code Section 2810-2815 | Continued the Southern California Earthquake Preparedness Project and the Bay Area Regional Earthquake Preparedness Project. |
| Health and Safety Code Section 16100-16110 | The Seismic Safety Commission and State Architect will develop a state policy on acceptable levels of earthquake risk for new and existing state-owned buildings. |
| Government Code Section 8871-8871.5 | Established the California Earthquake Hazards Reduction Act of 1986. |
| Health and Safety Code Section 130000-130025 | Defined earthquake performance standards for hospitals. |
| Public Resources Code Section 2805-2808 | Established the California Earthquake Education Project. |
| Government Code Section 8899.10-8899.16 | Established the Earthquake Research Evaluation Conference. |
| Public Resources Code Section 2621-2630 2621. | Established the Alquist-Priolo Earthquake Fault Zoning Act. |
| Government Code Section 8878.50-8878.52 8878.50. | Created the Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990. |
| Education Code Section 35295-35297 35295. | Established emergency procedure systems in kindergarten through grade 12 in all the public or private schools. |
| Health and Safety Code Section 19160-19169 | Established standards for seismic retrofitting of unreinforced masonry buildings. |

| | |
|---|---|
| Health and Safety Code Section 1596.80-1596.879 | Required all child day care facilities to include an Earthquake Preparedness Checklist as an attachment to their disaster plan. |
| Source: http://www.leginfo.ca.gov/calaw.html | |

**Earthquake Education**
Earthquake research and education activities are conducted at several major universities in the Southern California region, including Cal Tech, USC, UCLA, UCSB, UCI, and UCSB. The local clearinghouse for earthquake information is the Southern California Earthquake Center located at the University of Southern California, Los Angeles, CA 90089, Telephone: (213) 740-5843, Fax: (213) 740-0011, Email: SCEinfo@usc.edu, Website: http://www.scec.org
The Southern California Earthquake Center (SCEC) is a community of scientists and specialists who actively coordinate research on earthquake hazards at nine core institutions, and communicate earthquake information to the public. SCEC is a National Science Foundation (NSF) Science and Technology Center and is co-funded by the United States Geological Survey (USGS).

In addition, Los Angeles County along with other Southern California counties, sponsors the Emergency Survival Program (ESP), an educational program for learning how to prepare for earthquakes and other disasters. Many school districts have very active emergency preparedness programs that include earthquake drills and periodic disaster response team exercises.

**Earthquake Mitigation Action Items**
The earthquake mitigation action items provide guidance on suggesting specific activities that agencies, organizations, and residents in the City of Diamond Bar can undertake to reduce risk and prevent loss from earthquake events. Each action item is followed by ideas for implementation, which can be used by the planning committee and local decision makers in pursuing strategies for implementation:

Mitigation Action 6.4: Earthquake Preparedness: Encourage reduction of nonstructural and structural earthquake hazards in homes, schools, businesses, and government offices.
Ideas for Implementation

- Provide information to government building and school facility managers and teachers on securing bookcases, filing cabinets, light fixtures, and other objects that can cause injuries and block exits; and
- Encourage facility managers, business owners, and teachers to refer to FEMA's practical guidebook: “Reducing the Risks Nonstructural Earthquake Damage”; and
- Encourage homeowners and renters to use “Is Your Home Protected from Earthquake Disaster? A Homeowner’s Guide to Earthquake Retrofit” (IBHS) for economic and efficient mitigation techniques; and
- Explore partnerships to provide retrofitting classes for homeowners, renters, building professionals, and contractors; and
- Target development located in potential fault zones or in unstable soils for intensive education and retrofitting resources,

**Goals and Objective Implemented:** Protect Life and Property, Public Awareness
**Hazard Addressed:** Earthquake

**Lead Department:** Hazard Mitigation Action Committee
**Priority:** One

Mitigation Action 6.6: Earthquake Understanding: Improve knowledge of Earthquake hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas.
Ideas for Implementation

- Update the City of Diamond Bar earthquake hazard map with any new developments or recent earthquake activity.
- Provide public information to emphasize economic risk when building on potential or historical Earthquake areas.

**Goals and Objective Implemented:** Protect Life and Property, Earthquake mitigation
**Hazard Addressed:** Earthquake
**Lead Department:** Community Department
**Priority:** Two

Mitigation Action 6.7: Earthquake Construction Design: Encourage construction and subdivision design that can be applied to steep slopes to reduce the potential adverse impacts from development.

Ideas for Implementation

- Continue to require that all hillside/steep slope construction, be reviewed by Geo-Technical Engineer along with structural engineer.
- Increase communication and coordination between the city's Engineering and Building & Safety and Planning Departments to address any proposed developments that are within the Restrictive Land Use areas.
- Strictly Execute section 18 of the Current California code as it applies to building setbacks from top to toe of slope.

**Goals and Objective Implemented:** Protect Life and Property, Earthquake Damage Mitigation
**Hazard Addressed:** Earthquake
**Lead Department:** Community Development
**Priority:** One

Mitigation Action 6.8: Earthquake Building Codes: Review and revise building codes for any development in Earthquake prone areas.

- Structural member values have been reduced, which means that larger framing and structural members are to be used.
- Strict design criteria are mandated for both commercial and residential structures.
- Other changes include penetration through firewalls, flame barriers, parapet construction, labels for fire doors, and sprinklers requirements for "U" occupancies, means of egress and exit travel requirements through intervening rooms.
- Attic and laundry ventilation.
- Design loads for patio covers.
- Anchorage of concrete or masonry walls in seismic zone 3 and 4.

Prescriptive sill bolting requirements for seismic zone 3 and 4 has been increased.

**Goals and Objective Implemented:** Protect Life and Property, Earthquake Damage Mitigation
**Hazard Addresses:** Earthquake
**Lead Department:** Community development
**Priority:** One

---

[1] http://www.gps.caltech.edu/~sieh/home.html

[2] Planning for Natural Hazards: The California Technical Resource Guide, Department of Land Conservation and Development (July 2000)

[3] http://www.consrv.ca.gov/CGS/rghm/ap/

[4] Ibid

[5] Burby, R. (Ed.) Cooperating with Nature: Confronting Natural Hazards with Land Use Planning for Sustainable Communities (1998), Washington D.C., Joseph Henry Press.

[6] FEMA HAZUS http://www.fema.gov/hazus/hazus2.htm (May 2001).

[7] Source: Los Angeles County Public Works Department, March 2004

[8] http://www.chamber101.com/programs_committee/natural_disasters/DisasterPreparedness/Forty.htm

[9] Institute for Business and Home Safety Resources (April 2001)

[10] http://www.seismic.ca.gov/pub/CSSC_2001-04_Hospital.pdf

# SECTION 7: EARTH MOVEMENT (LANDSLIDES & DEBRIS FLOWS)

Landslides are a serious geologic hazard in almost every state in America. Nationally, landslides cause 25 to 50 deaths each year.[1] The best estimate of direct and indirect costs of landslide damage in the United States range between $1 and $2 billion annually.[2] As a seismically active region, California has had significant number of locations impacted by landslides. Some landslides result in private property damage; other landslides impact transportation corridors, fuel and energy conduits, and communication facilities. They can also pose a serious threat to human life.

Landslides can be broken down into two categories: (1) rapidly moving (generally known as debris flows), and (2) slow moving. Rapidly moving landslides or debris flows present the greatest risk to human life, and people living in or traveling through areas prone to rapidly moving landslides are at increased risk of serious injury. Slow moving landslides can cause significant property damage, but are less likely to result in serious human injuries.

According to the State of California, the City of Diamond Bar contains areas that have the potential for liquefaction and earthquake-induced landslides on Map 12. Since the settlement of the City in the 1800's, there have not (or have) been any instances of liquefaction associated with seismic activity.

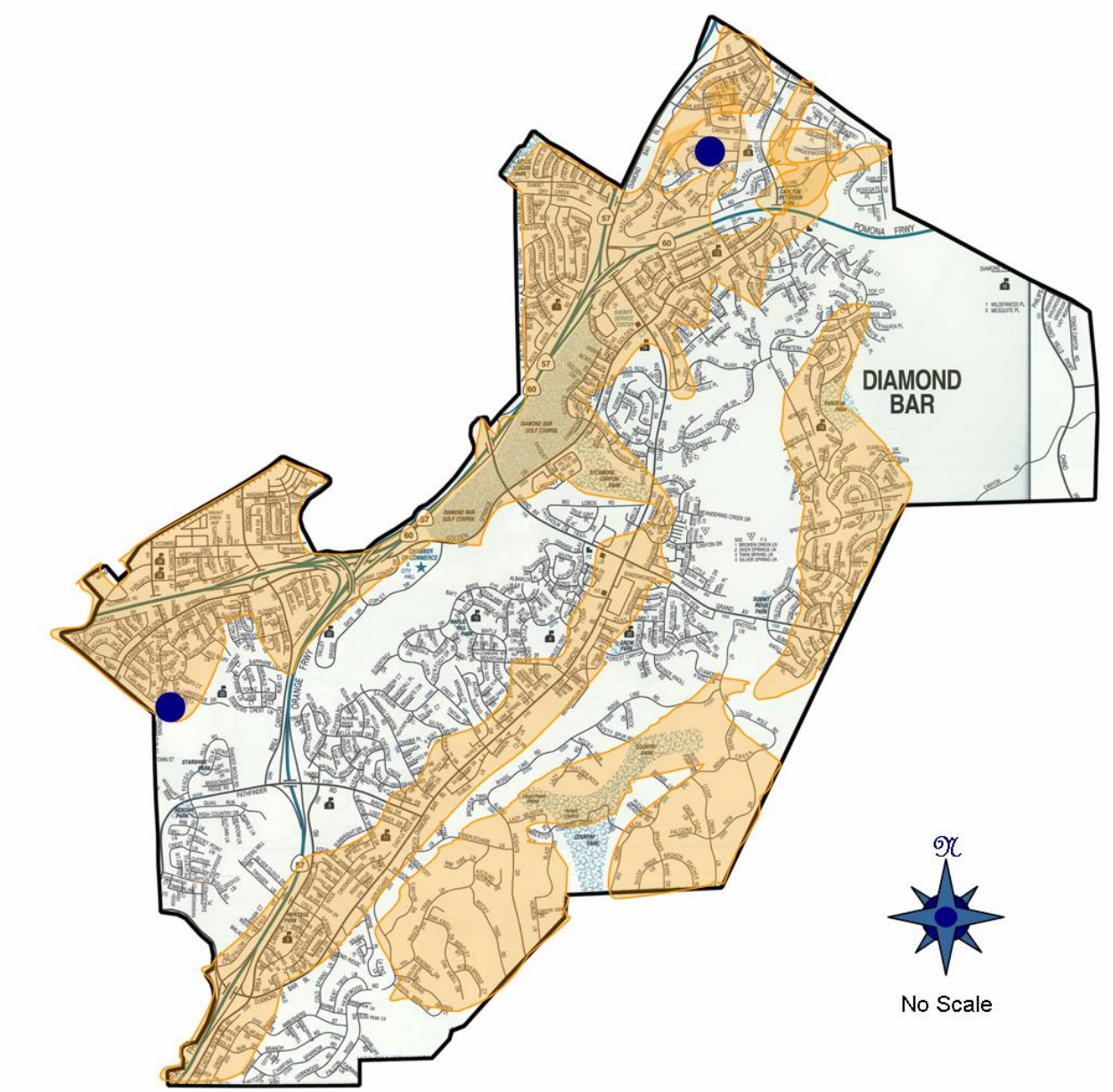
## HISTORIC SOUTHERN CALIFORNIA LANDSLIDES

**1928 St. Francis Dam failure**
Los Angeles County, California. The dam gave way on March 12, and its waters swept through the Santa Clara Valley toward the Pacific Ocean, about 54 miles away. Sixty five miles of valley was devastated, and over 500 people were killed. Damages were estimated at $672.1 million (year 2000 dollars).[3]

**1956 Portuguese Bend, California**
Cost, $14.6 million (2000 dollars) California Highway 14, Palos Verdes Hills. Land use on the Palos Verdes Peninsula consists mostly of single-family homes built on large lots, many of which have panoramic ocean views. All of the houses were constructed with individual septic systems, generally consisting of septic tanks and seepage pits. Landslides have been active here for thousands of years, but recent landslide activity has been attributed in part to human activity. The Portuguese Bend landslide began its modern movement in August 1956, when displacement was noticed at its northeast margin. Movement gradually extended downslope so that the entire eastern edge of the slide mass was moving within 6 weeks. By the summer of 1957, the entire slide mass was sliding towards the sea.[4]

**1958-1971 Pacific Palisades, California**
Cost, $29.1 million (2000 dollars) California Highway 1 and house damaged.[5]

**1961 Mulholland Cut, California**
Cost, $41.5 million (2000 dollars) On Interstate 405, 11 miles north of Santa Monica, Los Angeles County.[6]




# Map 12
# Potential Landslide Map

LEGEND

Potential Landslide

Recent Activity

Golf Course and Park Areas

**1963 Baldwin Hills Dam Failure**
On December 14, the 650 foot long by 155 foot high earth fill dam gave way and sent 360 million gallons of water in a fifty foot high wall cascading onto the community below, killing five persons, and damaging 50 million (1963 dollars) of dollars in property.

**1969 Glendora, California**
Cost, $26.9 million (2000 dollars) Los Angeles County, 175 houses damaged, mainly by debris flows.[7]

**1969 Seventh Ave., Los Angeles County, California**
Cost, $14.6 million (2000 dollars) California Highway 60.[8]

**1970 Princess Park, California**
Cost, $29.1 million (2000 dollars) California Highway 14, 10 miles north of Newhall, near Saugus, northern Los Angeles County.[9]

**1971 Upper and Lower Van Norman Dams, San Fernando, California**
Earthquake-induced landslides Cost, $302.4 million (2000 dollars). Damage due to the February 9, 1971, magnitude 7.5 San Fernando, California, earthquake. The earthquake of February 9 severely damaged the Upper and Lower Van Norman Dams.[10]

**1971 Juvenile Hall, San Fernando, California**
Landslides caused by the February 9, 1971, San Fernando, California, earthquake Cost, $266.6 million (2000 dollars). In addition to damaging the San Fernando Juvenile Hall, this 1.2 km-long slide damaged trunk lines of the Southern Pacific Railroad, San Fernando Boulevard, Interstate Highway 5, the Sylmar, California, electrical converter station, and several pipelines and canals.[11]

**1977-1980 Monterey Park, Repetto Hills, Los Angeles County, California**
Cost, $14.6 million (2000 dollars) 100 houses damaged in 1980 due to debris flows.[12]

**1978 Bluebird Canyon Orange County**
California October 2, cost, $52.7 million (2000 dollars) 60 houses destroyed or damaged. Unusually heavy rains in March of 1978 may have contributed to initiation of the landslide. Although the 1978 slide area was approximately 3.5 acres, it is suspected to be a portion of a larger, ancient landslide.[13]

**1979 Big Rock, California, Los Angeles County**
Cost, approximately $1.08 billion (2000 dollars) California Highway 1 rockslide.[14]

**1980 Southern California slides**
$1.1 billion in damage (2000 dollars) Heavy winter rainfall in 1979-90 caused damage in six Southern California counties. In 1980, the rainstorm started on February 8. A sequence of 5 days of continuous rain and 7 inches of precipitation had occurred by February 14. Slope failures were beginning to develop by February 15 and then very high-intensity rainfall occurred on February 16. As much as 8 inches of rain fell in a 6 hour period in many locations. Records and personal observations in the field on February 16 and 17 showed that the mountains and slopes literally fell apart on those 2 days.[15]

**1983 San Clemente, California, Orange County**
Cost, $65 million (2000 dollars), California Highway 1. Litigation at that time involved approximately $43.7 million (2000 dollars).[16]

**1983 Big Rock Mesa, California**
Cost, $706 million (2000 dollars) in legal claims condemnation of 13 houses, and 300 more threatened rockslide caused by rainfall [17]

**1978-1979, 1980 San Diego County, California**
Experienced major damage from storms in 1978, 1979, and 1979-80, as did neighboring areas of Los Angeles and Orange County, California. One hundred and twenty landslides were reported to have occurred in San Diego County during these 2 years. Rainfall for the rainy seasons of 78-79 and 79-80 was 14.82 and 15.61 inches (37.6 and 39.6 cm) respectively, compared to a 125-year average (1850-1975) of 9.71 inches (24.7 cm). Significant landslides occurred in the Friars Formation, a unit that was noted as slide-prone in the Seismic Safety Study for the City of San Diego. Of the nine landslides that caused damage in excess of $1 million, seven occurred in the Friars Formation, and two in the Santiago Formation in the northern part of San Diego County.[18]

**1994 Northridge, California Earthquake Landslides**
As a result of the magnitude 6.7 Northridge, California, earthquake, more than 11,000 landslides occurred over an area of 10,000 km2. Most were in the Santa Susana Mountains and in mountains north of the Santa Clara River Valley. Destroyed dozens of homes, blocked roads, and damaged oil-field infrastructure. Caused deaths from Coccidioidomycosis (valley fever) the spore of which was released from the soil and blown toward the coastal populated areas. The spore was released from the soil by the landslide activity.[19]

**March 1995 Los Angeles and Ventura Counties, Southern California**
Above normal rainfall triggered damaging debris flows, deep-seated landslides, and flooding. Several deep-seated landslides were triggered by the storms, the most notable was the La Conchita landslide, which in combination with a local debris flow, destroyed or badly damaged 11 to 12 homes in the small town of La Conchita, about 20 km west of Ventura. There also was widespread debris-flow and flood damage to homes, commercial buildings, and roads and highways in areas along the Malibu coast that had been devastated by wildfire 2 years before.[20]

**LOCAL EVENTS**

**February 1993 and 1998, Sycamore Canyon Landslides**
**May 19, 1995** As a result of heavy rains a landslide occurred in Rowland Heights unincorporated area of Los Angeles County and the City of Diamond Bar. A state of local emergency was declared by the City as well as by the Los Angeles County Board of Supervisors. This event became known as the **Morning Sun Landslide**. The slide area was within the jurisdictional boundaries of the City but the property on which the geological movement originated is owned by the Walnut Valley Unified School District. The landslide displaced some six hundred thousand cubic yards of earth but no one was injured and only a few of the approximately 20 property owners along Morning Sun suffered damage to their homes. The City of Diamond Bar expended approximately $30,000 for emergency services related to the event. The School District spent in excess of $1 million on emergency repairs.

On **February 23/24, 1998**, as earth movement on private property located on the hillside at **Minnequa Drive** in Diamond Bar created an unsafe condition for persons and property and a local emergency was declared by the City Council. Based on the emergency conditions, and to ensure that all appropriate relief was provided, the Chair of the Board of Supervisors, Los Angeles County, had proclaimed the existence of a county-wide local emergency on February 18, 1998.

The common slope failures occurred adjacent to 23837 Minnequa Drive and 23722 and 23724 Sunset Crossing Road, Lots 43, 90 and 91 of Tract 27539. According to the Findings and Conclusions section of the Geologic Report prepared by the consultant hired by the City, Kleinfelder, Inc., "Several shallow failures and surficial slumps were observed on the subject slope area. The failures do not appear to be deep-seated and are probably limited to the upper 3 – 8 feet in thickness. The observed failures may be due to various reasons, several of which include but are not limited to:

- Lack of homeowner maintenance of their respective portions of common slope area and terrace drains.
- Seasonally heavy or locally intense rain fall.
- Irrigation practices on the slope by the homeowners.
- The general weathering of the slope over the 30 years since the slope was graded.
- Activity of borrowing rodents.
- Types of vegetation planted or allowed to grow on slope.
- Outward relaxation and settlement of the fill and slope face.
- The 11/2:1 slope inclination and the type of soil materials comprising the fill slope.
- Grading codes and practices in effect at the time the slope was graded."

The City of Diamond Bar investigated this hazard by contracting with Kleinfelder, Inc. to perform geologic reconnaissance and evaluation of the common slope failures.

In addition, the City implemented a Landslide Remediation and Stabilization Project and entered into agreements with the effected homeowners. The City went out to bid and contracted with Summit Construction Company to perform the slope reconstruction for $150,000. The City contributed $50,000 of its Community Development Block Grant (CDBG) funds towards the project with the homeowners contributing the balance.

## LANDSLIDE CHARACTERISTICS

### What is a landslide?

"A landslide is defined as, the movement of a mass of rock, debris, or earth down a slope. Landslides are a type of "mass wasting" which denotes any down slope movement of soil and rock under the direct influence of gravity. The term "landslide" encompasses events such as rock falls, topples, slides, spreads, and flows. Landslides can be initiated by rainfall, earthquakes, volcanic activity, changes in groundwater, disturbance and change of a slope by man-made construction activities, or any combination of these factors. Landslides can also occur underwater, causing tidal waves and damage to coastal areas. These landslides are called submarine landslides."[21]

The size of a landslide usually depends on the geology and the initial cause of the landslide. Landslides vary greatly in their volume of rock and soil, the length, width, and depth of the area

affected, frequency of occurrence, and speed of movement. Some characteristics that determine the type of landslide are slope of the hillside, moisture content, and the nature of the underlying materials. Landslides are given different names, depending on the type of failure and their composition and characteristics.

Slides move in contact with the underlying surface. These movements include rotational slides where sliding material moves along a curved surface and translational slides where movement occurs along a flat surface. These slides are generally slow moving and can be deep. Slumps are small rotational slides that are generally shallow. Slow-moving landslides can occur on relatively gentle slopes and can cause significant property damage, but are far less likely to result in serious injuries than rapidly moving landslides.[22]

"Failure of a slope occurs when the force that is pulling the slope downward (gravity) exceeds the strength of the earth materials that compose the slope. They can move slowly, (millimeters per year) or can move quickly and disastrously, as is the case with debris-flows. Debris-flows can travel down a hillside of speeds up to 200 miles per hour (more commonly, 30 – 50 miles per hour), depending on the slope angle, water content, and type of earth and debris in the flow. These flows are initiated by heavy, usually sustained, periods of rainfall, but sometimes can happen as a result of short bursts of concentrated rainfall in susceptible areas. Burned areas charred by wildfires are particularly susceptible to debris flows, given certain soil characteristics and slope conditions."[23]

**What is a Debris Flow?**
A debris or mud flow is a river of rock, earth and other materials, including vegetation that is saturated with water. This high percentage of water gives the debris flow a very rapid rate of movement down a slope. Debris flows often with speeds greater than 20 mile per hour, and can often move much faster.[24] This high rate of speed makes debris flows extremely dangerous to people and property in its path.

## LANDSLIDE EVENTS AND IMPACTS

Landslides are a common hazard in California. Weathering and the decomposition of geologic materials produces conditions conducive to landslides and human activity further exacerbates many landslide problems. Many landslides are difficult to mitigate, particularly in areas of large historic movement with weak underlying geologic materials. As communities continue to modify the terrain and influence natural processes, it is important to be aware of the physical properties of the underlying soils as they, along with climate, create landslide hazards. Even with proper planning, landslides will continue to threaten the safety of people, property, and infrastructure, but without proper planning, landslide hazards will be even more common and more destructive.

The increasing scarcity of build-able land, particularly in urban areas, increases the tendency to build on geologically marginal land. Additionally, hillside housing developments in Southern California are prized for the view lots that they provide.

Rock falls occur when blocks of material come loose on steep slopes. Weathering, erosion, or excavations, such as those along highways, can cause falls where the road has been cut through bedrock. They are fast moving with the materials free falling or bouncing down the slope. In falls, material is detached from a steep slope or cliff. The volume of material involved is generally small, but large boulders or blocks of rock can cause significant damage.

Earth flows are plastic or liquid movements in which land mass (e.g. soil and rock) breaks up and flows during movement. Earthquakes often trigger flows.[25] Debris flows normally occur when a landslide moves downslope as a semi-fluid mass, scouring or partially scouring soils from the slope along its path. Flows are typically rapidly moving and also tend to increase in volume as they scour out the channel.[26] Flows often occur during heavy rainfall, can occur on gentle slopes, and can move rapidly for large distances.

## LANDSLIDE CONDITIONS

Landslides are often triggered by periods of heavy rainfall. Earthquakes, subterranean water flow and excavations may also trigger landslides. Certain geologic formations are more susceptible to landslides than others. Human activities, including locating development near steep slopes, can increase susceptibility to landslide events. Landslides on steep slopes are more dangerous because movements can be rapid.

Although landslides are a natural geologic process, the incidence of landslides and their impacts on people can be exacerbated by human activities. Grading for road construction and development can increase slope steepness. Grading and construction can decrease the stability of a hill slope by adding weight to the top of the slope, removing support at the base of the slope, and increasing water content. Other human activities effecting landslides include: excavation, drainage and groundwater alterations, and changes in vegetation.[27]

Wildland fires in hills covered with chaparral are often a precursor to debris flows in burned out canyons. The extreme heat of a wildfire can create a soil condition in which the earth becomes impervious to water by creating a waxy-like layer just below the ground surface. Since the water cannot be absorbed into the soil, it rapidly accumulates on slopes, often gathering loose particles of soil in to a sheet of mud and debris. Debris flows can often originate miles away from unsuspecting persons, and approach them at a high rate of speed with little warning.

## NATURAL CONDITIONS

Natural processes can cause landslides or re-activate historical landslide sites. The removal or undercutting of shoreline-supporting material along bodies of water by currents and waves produces countless small slides each year. Seismic tremors can trigger landslides on slopes historically known to have landslide movement. Earthquakes can also cause additional failure (lateral spreading) that can occur on gentle slopes above steep streams and riverbanks.

## PARTICULARLY HAZARDOUS LANDSLIDE AREAS

Locations at risk from landslides or debris flows include areas with one or more of the following conditions:

- On or close to steep hills;
- Steep road-cuts or excavations;
- Existing landslides or places of known historic landslides (such sites often have tilted power lines, trees tilted in various directions, cracks in the ground, and irregular-surfaced ground);
- Steep areas where surface runoff is channeled, such as below culverts, V -shaped valleys, canyon bottoms, and steep stream channels; and

- ❖ Fan-shaped areas of sediment and boulder accumulation at the outlets of canyons.
- ❖ Canyon areas below hillside and mountains that have recently (within 1-6 years) been subjected to a wildland fire.

## IMPACTS OF DEVELOPMENT

Although landslides are a natural occurrence, human impacts can substantially affect the potential for landslide failures in the City of Diamond Bar. Proper planning and geotechnical engineering can be exercised to reduce the threat of safety of people, property, and infrastructure.

### Excavation and Grading

Slope excavation is common in the development of home sites or roads on sloping terrain. Grading these slopes can result in some slopes that are steeper than the pre-existing natural slopes. Since slope steepness is a major factor in landslides, these steeper slopes can be at an increased risk for landslides. The added weight of fill placed on slopes can also result in an increased landslide hazard. Small landslides can be fairly common along roads, in either the road cut or the road fill. Landslides occurring below new construction sites are indicators of the potential impacts stemming from excavation.

## DRAINAGE AND GROUNDWATER ALTERATIONS

Water flowing through or above ground is often the trigger for landslides. Any activity that increases the amount of water flowing into landslide-prone slopes can increase landslide hazards. Broken or leaking water or sewer lines can be especially problematic, as can water retention facilities that direct water onto slopes. However, even lawn irrigation in landslide prone locations can result in damaging landslides. Ineffective storm water management and excess runoff can also cause erosion and increase the risk of landslide hazards. Drainage can be affected naturally by the geology and topography of an area; Development that results in an increase in an impervious surface impairs the ability of the land to absorb water and may redirect water to other areas. Channels, streams, ponding, and erosion on slopes all indicate potential slope problems.

Road and driveway drains, gutters, downspouts, and other constructed drainage facilities can concentrate and accelerate flow. Ground saturation and concentrated velocity flow are major causes of slope problems and may trigger landslides.[28]

## CHANGES IN VEGETATION

Removing vegetation from very steep slopes can increase landslide hazards. Areas that experience wildfire and land clearing for development may have long periods of increased landslide hazard. Also, certain types of ground cover have a much greater need for constant watering to remain green. Changing away from native ground cover plants may increase the risk of landslide.

## LANDSLIDE HAZARD ASSESSMENT

### Hazard Identification

Identifying hazardous locations is an essential step towards implementing more informed mitigation activities. The Restricted Use Areas have been noted on the Land Use Restrictive

Area Map (Map 13). An applicant must submit a request to construct in a Restricted Use Area.

If the applicant can resolve any and all drainage and/or geologic issues and satisfy the City Geologist and City Engineer that a factor of safety greater than 1.5 can be established, approval will be granted with appropriate conditions of approval. This does not remove the Restricted Use Area designation. If a factor of safety of 1.5 cannot be proven, the City may still consider some approvals with appropriate conditions and a signed and recorded Covenant and Agreement. Only non-habituated structures may be built (i.e. swimming pools, tennis courts) in Restricted Use Areas.

**Vulnerability and Risk**

Vulnerability assessment for landslides will assist in predicting how different types of property and population groups will be affected by a hazard.[29] Data that includes specific landslide-prone and debris flow locations in the City can be used to assess the population and total value of property at risk from future landslide occurrences.

While a quantitative vulnerability assessment (an assessment that describes number of lives or amount of property exposed to the hazard) has not yet been conducted for City of Diamond Bar landslide events, there are many qualitative factors that point to potential vulnerability. Landslides can impact major transportation arteries, blocking residents from essential services and businesses.

Factors included in assessing landslide risk include population and property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, soil characteristics, and precipitation intensity. This type of analysis could generate estimates of the damages to the City due to a specific landslide or debris flow event.

As noted, the City of Diamond Bar is vulnerable to landslides. The extent of these slides could range as high as several acres in area and several thousand cubic yards in mass depending on the location and severity of rainfall.

## COMMUNITY LANDSLIDE ISSUES

**What is Susceptible to Landslides?**

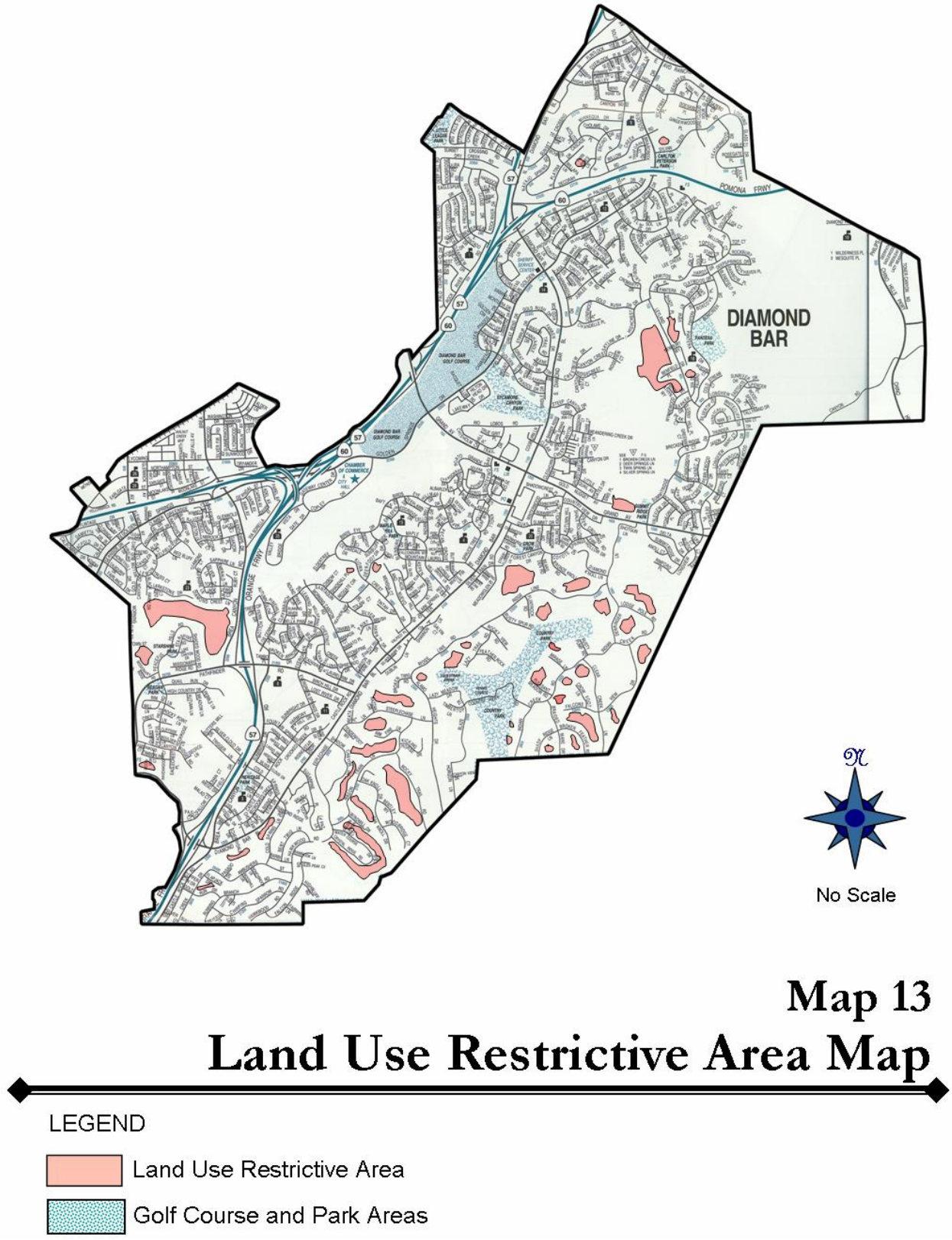
Landslides can affect utility services, transportation systems, and critical lifelines. Communities may suffer immediate damages and loss of service. Disruption of infrastructure, roads, and critical facilities may also have a long-term effect on the economy. Utilities, including potable water, wastewater, telecommunications, natural gas, and electric power are all essential to service community needs. Loss of electricity has the most widespread impact on other utilities and on the whole community. Natural gas pipes may also be at risk of breakage from landslide movements as small as an inch or two.

**Roads and Bridges**

The City of Diamond Bar Public Works Division is responsible for responding to slides that inhibit the flow of traffic or are damaging a road or a bridge. The Public Works Division will communicate with residents impacted by landslides, but only repair the road itself, as well as the areas adjacent to the slide where the City has the right of way.

## LIFELINES AND CRITICAL FACILITIES

Lifelines and critical facilities should remain accessible, if possible, during a natural hazard event. The impact of closed transportation arteries may be increased if the closed road or bridge




**Map 13**
**Land Use Restrictive Area Map**

is critical for hospitals and other emergency facilities. Therefore, inspection and repair of critical transportation facilities and routes is essential and should receive high priority. Losses of power and phone service are also potential consequences of landslide events. Due to heavy rains, soil erosion in hillside areas can be accelerated, resulting in loss of soil support beneath high voltage transmission towers in hillsides and remote areas. Flood events can also cause landslides, which can have serious impacts on gas lines that are located in vulnerable soils.

## LANDSLIDE MITIGATION ACTIVITIES

Landslide mitigation activities include current mitigation programs and activities that are being implemented by local or city organizations.

### Landslide Building/Zoning Codes

The City of Diamond Bar Development Code addresses development on steep slopes in Chapter 22.22, Hillside Management. Generally, the ordinance requires soils and engineering geologic studies for developments. More detailed surface and subsurface investigations shall be warranted if indicated by engineering and geologic studies to sufficiently describe existing conditions. This may include soils, vegetation, geologic formations, and drainage patterns. Site evaluations may also occur where stability might be lessened by proposed grading/filling or land clearing.

Since 1972, the California Building Codes have addressed the need for mitigation of possible landslide activities. Furthermore, due to the knowledge acquired by designers and code administrators during the period following the 1998 Northridge earthquake, numerous changes were implemented to the California Building Code to require further surface and subsurface investigations and stabilization of the soils prior to structure construction.

Amendments to the California Building Code were adopted by the City of Diamond Bar in 2002 giving all authority and duties usually exercised by the Building Official on all items dealing with excavation and grading to the City Engineer. This amendment was proposed due to the complexity of the submitted grading plans and the diverse topography in the City. Dealing with this type of challenge requires the expertise of a civil engineer that is accustomed to addressing these issues.

### Landslide Mitigation Action Items

The landslide mitigation action items provide direction on specific activities that the City, organizations, and residents in City of Diamond Bar can undertake to reduce risk and prevent loss from landslide events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

> **Mitigation Action 6.2: Landslide Prevention.** In coordination with Walnut Valley Water District and L.A. County Sewer, maintain routine maintenance and repairs of water and sewer lines in and around landslide prone areas to avoid long-term leaks that saturate and de-stabilize earth materials to the point of dangerous and destructive landslides.
>
> **Goals and Objective Implemented:** 1 and 5.
>
> **Hazards Addressed:** Landslides and Earth Movement.

**Lead Department:** Public Works
**Priority:** One

**Mitigation Action 6.3: Landslide Prevention – Code Compliance/Interdepartmental Communication/Public and Contractor Education.** Continue to require that all hillside/steep slope construction and/or improvements be reviewed by a Soils and Geotechnical Engineer for soil stability. Continue communication and coordination between the City's Engineering, Planning and Building & Safety Departments to address any proposed developments that are in areas with slope stability risks.

Educate residents yearly through articles explaining how to care for storm water drainage devices located on their property in order to prevent back up and possible saturation of soil. Place articles in local newspaper publications as well as the City of Diamond Bar's monthly "City News" which is mailed to every household.

Provide informational brochures to the public on protecting personal property from erosion due to excessive landscape irrigation, damaged and/or clogged drainage swales, and other drainage devices.

Provide informational brochures to contractors providing services to the homeowner to reduce the risks of landslides through proper usage of drainage devices and landscape sprinklers.

**Goals and Objectives Implemented:** 1-Protect Life and Property, 2-Public Awareness, 3-Natural Systems, 4-Parnerships and Implementation.

**Hazards Addressed:** Landslides and Earth Movement.
**Lead Department:** Public Works, Building and Safety
**Priority:** One

---

1. Mileti, Dennis, *Disasters by Design: A Reassessment of Natural Hazards in the United States* (1999) Joseph Henry Press, Washington D.C.

2. Brabb, E.E., and B.L Harrod. (Eds) *Landslides: Extent and Economic Significance. Proceedings of the 28th International Geological Congress Symposium on Landslides.* (1989) Washington D.C., Rotterdam: Balkema.

3. Highland, L.M., and Schuster, R.L., *Significant Landslide Events in the United States.* (No Date) USGS, Washington D.C., http://landslides.usgs.gov.html_files/pubs/report1/Landslides_pass_508.pdf

4. Ibid.

5. Ibid.

6. Ibid.

7. Ibid.

8. Ibid.

9. Ibid.

10. Ibid.

11. Ibid.

12. Ibid.

13. Ibid.

14. Ibid.

15. Ibid.

16. Ibid.

17. Ibid.

18. Ibid.

19. Ibid.

20. Ibid.

21. Landslide Hazards, U.S. Geological Survey Fact Sheet 0071-00, Version 1.0, U.S. Department of the Interior - U.S. Geological Survey, http://pubs.usgs.gov/fs/fs-0071-00/

22. Interagency Hazard Mitigation Team, *State Hazard Mitigation Plan* (2000) Oregon Emergency Management

23. Ibid.

24. Barrows, Alan and Smith, Ted, DMG Note 13, http://www.consrv.ca.gov/cgs/information/publications/cgs_notes/note_33/

25. Robert Olson Associates, *Metro Regional Hazard Mitigation and Planning Guide* (June 1999) Metro

26. Ibid.

27. Planning For Natural Hazards: *The Oregon Technical Resource Guide*, Department of Land Conservation and Development (2000), Ch 5.

28. *Homeowners Guide for Landslide Control, Hillside Flooding, Debris Flows, Soil Erosion*, (March 1997)

29. Burby, R. (Ed.) *Cooperating With Nature* (1998) Washington, D.C.: Joseph Henry Press.

## SECTION 8: FLOOD

Floods can be caused by storms, water backup due to overloaded drainage systems, dam or levee failure, etc. Although the risk of disastrous flooding in Diamond Bar is relatively small, when compared to the potential for earthquake or wildfire damage to the City, the potential for a major flood event still exists.

At present, there are no major flooding problems identified within the City limits of Diamond Bar (Koss 1990, FDS 1998, FEMA 1980) (See Potential Flood Hazard Map – Map 14). According to the Federal Emergency Management Agency (FEMA), the Flood Insurance Rate (FIRM) Map for Diamond Bar shows that essentially all of the lands within the City limits are within flood zone "C", which means "areas of minimal flooding" (FEMA 1980). However, there are two areas within the City sphere of influence that have identified flood hazards according to the FEMA study:

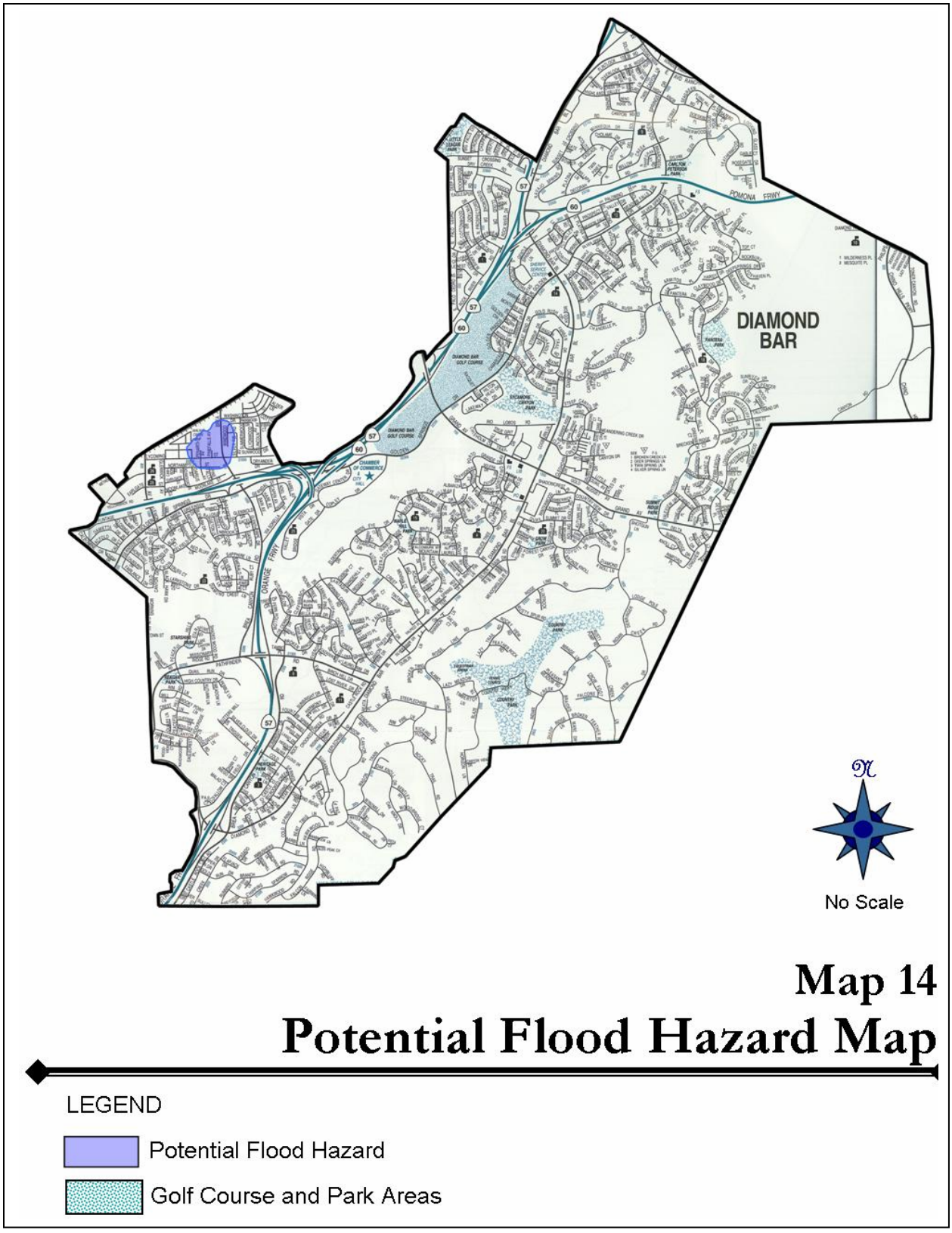
- Reed Canyon Channel: One small section of Diamond Bar Creek, at the intersection of Old Brea Canyon Road, just north of the 60 Freeway, was identified by the FIRM study as having a slight flooding potential. This portion of the creek is referred to as the Reed Canyon Channel. A small area immediately upstream (just east) of the roadway is classified as flood zone "A", which means that it is an area of 100-year flooding, but no base flood elevations or flood hazard factors have been determined. A slightly larger area downstream (just west) of Brea Canyon has a flood zone designation of "AO", which means areas of shallow flooding during a 100-year flood, where depths are between one (1) and three (3) feet. Average depths of inundation are shown (on the FIRM map), but no specific flood assessment has been made (FEMA 1980). Since then, the area has been mitigated and the FIRM map will need to be updated. Reed Canyon is no longer considered a flood problem area.

- Tonner Canyon: A portion of lower Tonner Canyon has been assigned a flood designation of "A" by FEMA because it is subject to 100-year flooding. However, no base flood elevations or specific flood hazards have been determined. In addition, the FIRM study only addressed canyon flooding up to one mile north of the Orange/Los Angeles County line, and no additional studies have been done. It is therefore possible that additional flooding potential exists within Tonner Canyon that has not been identified as yet.

The flood plain of the San Jose Creek is also adjacent to the City of Diamond Bar in two locations:

- near Old Brea Canyon Road north of the 60 Freeway, and
- north of Sunset Crossing and the 57 Freeway.

Much of the land in these areas is adjacent to the eastern bank of the creek, and is planned for industrial uses. The FEMA study classified these areas as flood zone "D", meaning "areas of undetermined, but possible, flood hazards" (FEMA 1980).




# Map 14
# Potential Flood Hazard Map

LEGEND

Potential Flood Hazard

Golf Course and Park Areas

Source: City of Diamond Bar

## HISTORY OF FLOODING IN THE CITY OF DIAMOND BAR

Historical flooding in Diamond Bar has been related to heavy rains. In January 1995, heavy rains caused extensive channel erosion and undermining of the bridge footings and concrete channel lining at Sycamore Canyon Park (22930 Golden Springs Road). The damage was limited to the park area with no reported casualties or injuries. Total loss was $37,150 with FEMA providing assistance to repair the channel. Footings were repaired and large rock along the channel was placed to prevent future erosion. No flooding in the area has been reported since the mitigation measures were put in place.

## HISTORIC FLOODING IN LOS ANGELES COUNTY

There are a number of rivers/creeks and dams in the Southern California region. The rivers and dams closest to Diamond Bar are those located within the Los Angeles County boundary. Those rivers and dams are listed below. The closest of these is the San Jose Creek which is northwest of the City and is located in the City of Industry. In addition, it should be noted that none of these water area flow through the City of Diamond Bar and there has been no historic flooding caused by any of these rivers or dams in the City of Diamond Bar.

Rivers/creeks: Los Angeles River
Rio Hondo River
San Gabriel River
Rio Hondo River
San Jose Creek
Coyote Creek
Compton Creek
Ballona Creek
Walnut Creek

Dams: Sepulveda Dam
Lopez Dam
Hansen Dam
Whittier Narrows Dam
Santa Fe Dam

## WHAT FACTORS CREATE FLOOD RISK?

Flooding occurs when climate, geology, and hydrology combine to create conditions where water flows outside of its usual course. In the City of Diamond Bar, geography and climate combine to create potential seasonal flooding conditions as was the case with the January 1995 winter storm.

## FLOOD TERMINOLOGY

### Floodplain

A floodplain is a land area adjacent to a river, stream, lake, estuary, or other water body that is subject to flooding. This area, if left undisturbed, acts to store excess flood water. The

floodplain is made up of two sections: the floodway and the flood fringe.

**100-Year Flood**
The 100-year flooding event is the flood having a one percent chance of being equaled or exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years. The 100-year floodplain is the area adjoining a river, stream, or watercourse covered by water in the event of a 100-year flood.

**Floodway**
The floodway is one of two main sections that make up the floodplain. Floodways are defined for regulatory purposes. Unlike floodplains, floodways do not reflect a recognizable geologic feature. For NFIP purposes, floodways are defined as the channel of a river or stream, and the overbank areas adjacent to the channel. The floodway carries the bulk of the flood water downstream and is usually the area where water velocities and forces are the greatest. NFIP regulations require that the floodway be kept open and free from development or other structures that would obstruct or divert flood flows onto other properties.

**Development**
For floodplain ordinance purposes, development is broadly defined by the City of Diamond Bar Zoning Ordinance to mean “Any construction activity or alteration of the landscape, its terrain contour or vegetation, including the erection or alteration of structures. New development is any construction, or alteration of an existing structure or land use, or establishment of a land use, after the effective date of the development code." The definition of development for floodplain purposes is generally broader and includes more activities than the definition of development used in other sections of local land use ordinances.

**Base Flood Elevation (BFE)**
The term "Base Flood Elevation" refers to the elevation (normally measured in feet above sea level) that the base flood is expected to reach. Base flood elevations can be set at levels other than the 100-year flood. Some communities choose to use higher frequency flood events as their base flood elevation for certain activities, while using lower frequency events for others. For example, for the purpose of storm water management, a 25-year flood event might serve as the base flood elevation; while the 500-year flood event may serve as base flood elevation for the tie down of mobile homes. The regulations of the NFIP focus on development in the 100-year floodplain.

## CHARACTERISTICS OF FLOODING

**Riverine Flooding**
Riverine flooding is the overbank flooding of rivers and streams. The natural processes of riverine flooding add sediment and nutrients to fertile floodplain areas. Flooding in large river systems typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing flooding in hundreds of smaller streams, which then drain into the major rivers.

**Urban Flooding**
As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin.

Heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. The water moves from the clouds, to the ground, and into streams at a much faster rate in urban areas. Adding these elements to the hydrological systems can result in flood waters that rise very rapidly and peak with violent force.

**Dam Failure Flooding**

The Los Angeles County drainage area map shows five dams. These dams pose no threat to Diamond Bar because of their distance from the city. In addition, FEMA requires that all dam owners develop Emergency Action Plans (EAP) for warning, evacuation, and post-flood actions. (See Map 15 Dam Failure Inundation Map)

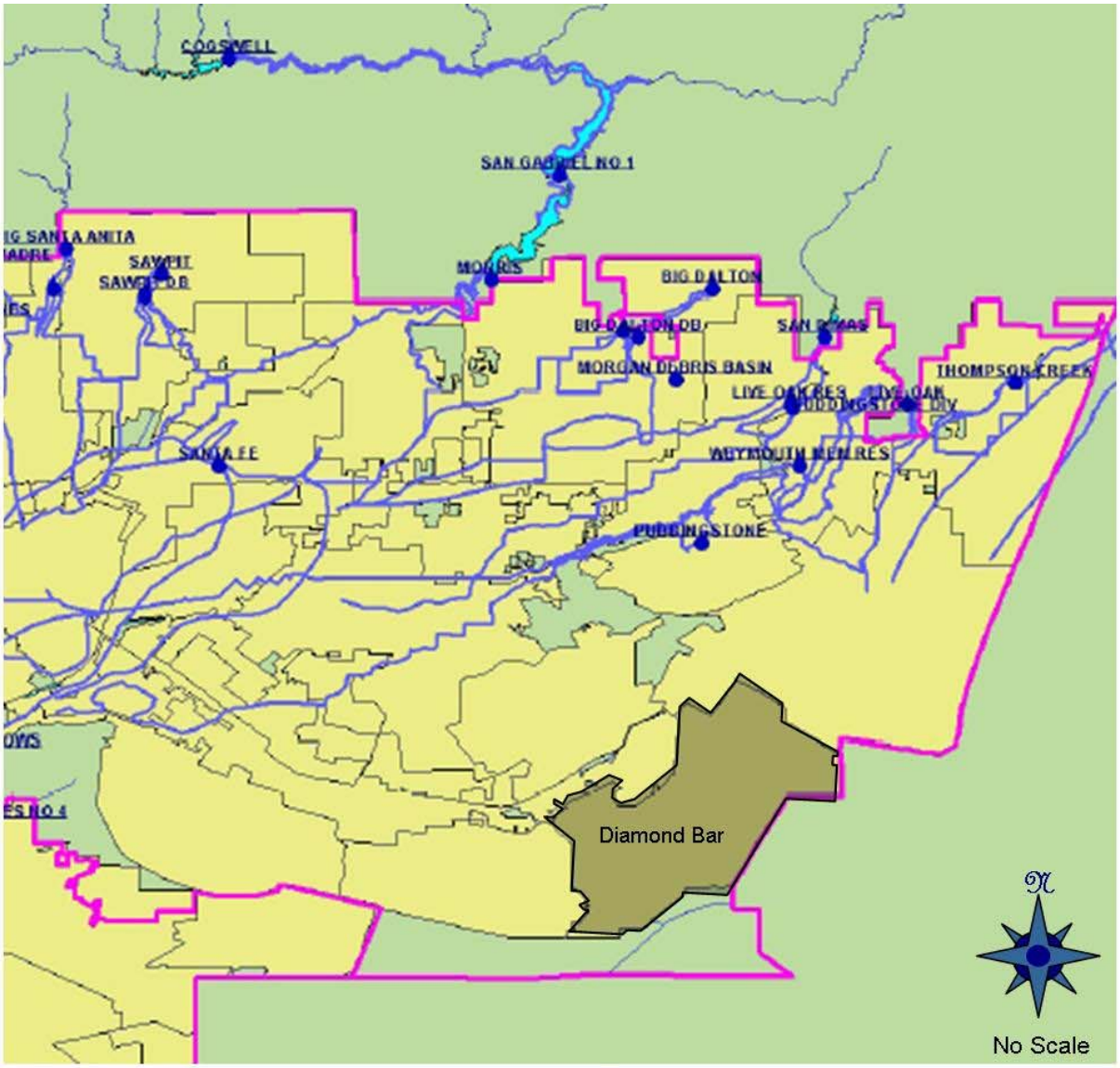
**Debris Flows**

Another flood related hazard that can affect certain parts of the Southern California region are debris flows. Most typically debris flows occur in mountain canyons and the foothills against the San Gabriel Mountains. However, any hilly or mountainous area with intense rainfall and the proper geologic conditions may experience one of these very sudden and devastating events.

> "Debris flows, sometimes referred to as mudslides, mudflows, lahars, or debris avalanches, are common types of fast-moving landslides. These flows generally occur during periods of intense rainfall or rapid snow melt. They usually start on steep hillsides as shallow landslides that liquefy and accelerate to speeds that are typically about 10 miles per hour, but can exceed 35 miles per hour. The consistency of debris flows ranges from watery mud to thick, rocky mud that can carry large items such as boulders, trees, and cars. Debris flows from many different sources can combine in channels, and their destructive power may be greatly increased. They continue flowing down hills and through channels, growing in volume with the addition of water, sand, mud, boulders, trees, and other materials. When the flows reach flatter ground, the debris spreads over a broad area, sometimes accumulating in thick deposits that can wreak havoc in developed areas."[12]

## WHAT IS THE EFFECT OF DEVELOPMENT ON FLOODS?

When structures or fill are placed in the floodway or floodplain water is displaced. Development raises the river levels by forcing the river to compensate for the flow space obstructed by the inserted structures and/or fill. When structures or materials are added to the floodway or floodplain and no fill is removed to compensate, serious problems can arise. Flood waters may be forced away from historic floodplain areas. As a result, other existing floodplain areas may experience flood waters that rise above historic levels. Displacement of only a few inches of water can mean the difference between no structural damage occurring in a given flood event, and the inundation of many homes, businesses, and other facilities. Careful attention should be given to development that occurs within the floodway to ensure that structures are prepared to withstand base flood events. In highly urbanized areas, increased paving can lead to an increase in volume and velocity of runoff after a rainfall event, exacerbating the potential flood hazards. Care should be taken in the development and implementation of storm water management systems to ensure that these runoff waters are dealt with effectively.




# Map 15
# Dam Failure Inundation Map

LEGEND

City of Diamond Bar

Dam Location

Inundation Flow Route

Source: Los Angeles County

The City of Diamond Bar is not in a Dam Failure Inundation Area.

## HOW ARE FLOOD-PRONE AREAS IDENTIFIED?

Flood maps and Flood Insurance Studies (FIS) are often used to identify flood-prone areas. The National Flood Insurance Program (NFIP) was established in 1968 as a means of providing low-cost flood insurance to the nation's flood-prone communities. The NFIP also reduces flood losses through regulations that focus on building codes and sound floodplain management. In the City of Diamond Bar, the NFIP and related building code regulations went into effect on July 31, 1991. NFIP regulations (44 Code of Federal Regulations (CFR) Chapter 1, Section 60, 3) require that all new construction in floodplains must be elevated at or above base flood level.

Water surface elevations are combined with topographic data to develop Flood Insurance Rate Maps (FIRMs). FIRMs illustrate areas that would be inundated during a 100-year flood, floodway areas, and elevations marking the 100-year-flood level. In some cases they also include base flood elevations (BFEs) and areas located within the 500-year floodplain. Flood Insurance Studies and FIRMs produced for the NFIP provide assessments of the probability of flooding at a given location. FEMA conducted many Flood Insurance Studies in the late 1970s and early 1980s. These studies and maps represent flood risk at the point in time when FEMA completed the studies. However, it is important to note that not all 100-year or 500-year floodplains have been mapped by FEMA.

The FEMA FIRM map for the City of Diamond Bar (Community-Panel Number 065043 0980 B – On file at City Hall) became effective December 2, 1980. Some portions of the city have not been mapped. In addition, since the effective date of the FIRM, man-made and natural changes to the environment have changed the dynamics of storm water run-off since then.

## HAZARD IDENTIFICATION

Hazard identification is the first phase of flood-hazard assessment. Identification is the process of estimating: (1) the geographic extent of the floodplain (i.e., the area at risk from flooding); (2) the intensity of the flooding that can be expected in specific areas of the floodplain; and (3) the probability of occurrence of flood events. This process usually results in the creation of a floodplain map. Floodplain maps provide detailed information that can assist jurisdictions in making policies and land-use decisions.

## VULNERABILITY ASSESSMENT

Vulnerability assessment is the second step of flood-hazard assessment. It combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events. Because site-specific inventory data and inundation levels given for a particular flood event (10-year, 25-year, 50-year, 100-year, and 500-year) are not readily available, calculating a community's vulnerability to flood events is not straightforward. The amount of property in the floodplain, as well as the type and value of structures on those properties, should be calculated to provide a working estimate for potential flood losses.

## RISK ANALYSIS

Risk analysis is the third and most advanced phase of a hazard assessment. It builds upon the hazard identification and vulnerability assessment. A flood risk analysis for the City of Diamond Bar should include two components: (1) the life and value of property that may incur losses from a flood event (defined through the vulnerability assessment); and (2) the number and type of flood events expected to occur over time. Within the broad components of a risk analysis, it is possible to predict the severity of damage from a range of events. Flow velocity models can assist in predicting the amount of damage expected from different magnitudes of flood events. The data used to develop these models is based on hydrological analysis of landscape features. Changes in the landscape, often associated with human development, can alter the flow velocity and the severity of damage that can be expected from a flood event.

With regard to severity, Diamond Bar receives an average of 11 inches of rain per year which makes flooding – even in susceptible areas – a low risk. Potential for property or human loss is very low.

## COMMUNITY FLOOD ISSUES

### What is Susceptible to Damage during a Flood Event?

The largest impact on communities from flood events is the loss of life and property. During certain years, property losses resulting from flood damage are extensive. Development in the floodplains of the City of Diamond Bar will continue to be at risk from flooding because flood damage occurs on a regular basis throughout the county. Property loss from floods strikes both private and public property.

### Property Loss Resulting from Flooding Events

The type of property damage caused by flood events depends on the depth and velocity of the flood waters. Faster moving flood waters can wash buildings off their foundations and sweep cars downstream. Pipelines, bridges, and other infrastructure can be damaged when high waters combine with flood debris. Extensive damage can be caused by basement flooding and landslide damage related to soil saturation from flood events. Most flood damage is caused by water saturating materials susceptible to loss (i.e., wood, insulation, wallboard, fabric, furnishings, floor coverings, and appliances). In many cases, flood damage to homes renders them unlivable.

### Mobile Homes

Statewide, the 1996 floods destroyed 156 housing units. Of those units, 61% were mobile homes and trailers. Throughout California, many mobile home parks are located in floodplain areas. Mobile homes have a lower level of structural stability than stick-built homes, and must be anchored to provide additional structural stability during flood events. Manufactured homes are another form of housing structure but there are none in the City of Diamond Bar.

The mobile home parks listed below have some portion of their property in the 100-year floodplain which is mapped on the FIRM. However, this area is located in the Reed Canyon Channel area has been mitigated and the FIRM will need to be updated.

1. Brea Canyon and Lycoming
2. East of Brea Canyon on Washington

To ensure stability of mobile homes, City of Diamond Bar municipal code requires that all new

and replacement mobile homes and additions to mobile homes shall:
(1) Be elevated so that the lowest floor is at or above the base flood elevation; and
(2) Be securely anchored to a permanent foundation system to resist flotation, collapse or lateral movement. CD18:13/ (Ord. No. 30(1989), §3(16), 6-19-80)

**Roads**

During natural hazard events, or any type of emergency or disaster, dependable road connections are critical for providing emergency services. Roads systems in the City of Diamond Bar are maintained by multiple jurisdictions. Federal, state, county, and city governments all have a stake in protecting roads from flood damage. Road networks often traverse floodplain and floodway areas. Transportation agencies responsible for road maintenance are typically aware of roads at risk from flooding.

**Bridges**

Bridges are usually key points of concern during flood events because they are important links in road networks, river crossings, and they can be obstructions in watercourses, inhibiting the flow of water during flood events. The bridges in the City of Diamond Bar are state owned. A state-designated inspector must inspect all state, county, and city bridges every two years. The inspections are rigorous, looking at everything from seismic capability to erosion and scour.

The City of Diamond Bar is located at the junction of the Orange (57) and Pomona (60) freeways. There are eight underpasses and two overpasses. These include:

57 & 60 Freeways Interchange
Sunset Crossing @ 57 Freeway Underpass
Diamond Bar Blvd. @ 60 Freeway Underpass
Prospectors @ 57 & 60 Freeways Underpass
Golden Springs @ 60 Freeway Underpass
Grand Ave. @ 60 Freeway Overpass
Brea Canyon Road @ 60 Freeway Underpass
Lemon @ 60 Freeway Underpass
Pathfinders @ 57 Freeway Overpass
Cold Springs @ 57 Freeway Underpass
Brea Canyon Cut-Off @ 57 Freeway Underpass

These are all constructed at grade and are not historically susceptible to flooding.

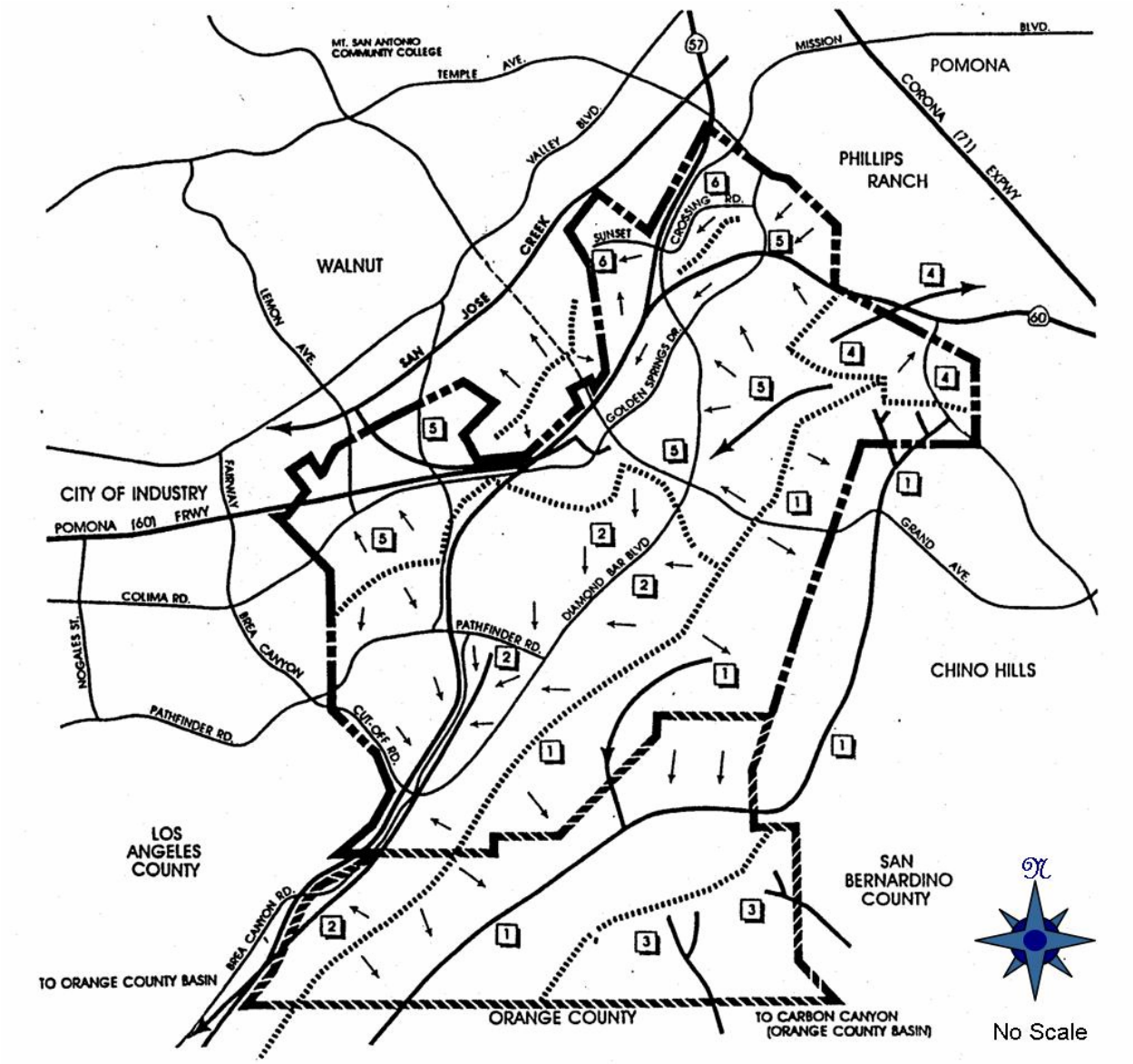
**Storm Water Systems**

Local drainage problems can occur in the City of Diamond Bar. The City of Diamond Bar Public Works staff is aware of local drainage threats. The problems are often present where storm water runoff enters culverts or goes underground into storm drains. Inadequate maintenance can also contribute to the flood hazard in urban areas.

The City contracts for street maintenance services. Some of the services provided include flood control measures including catch basin cleaning; storm patrol/debris clean-up; curb-gutter-sidewalk inspection and repairs.

**Drainage Basins**

The varied topography of Diamond Bar creates complex drainage patterns through a number of local watercourses. Seasonal runoff from the City of Diamond Bar and its sphere of influence flow into Los Angeles County to the west and Orange County to the south, with a minor amount going into San Bernardino County (Chino Basin) to the east. (See Drainage Basin Map – Map 16).




# Map 16
# Drainage Basins Map

LEGEND

- Ridgelines/Divides
- Local Water Sheds
- Flow Lines
- # Basins

1 Tonner Cayon Creek
2 Brea Canyon Creek
3 Carbon Canyon Creek
4 Chino Creek Basin
5 Diamond Bar Creek
6 Sunset Crossing Channel

Source: County of Los Angeles

Diamond Bar Creek and Sunset Crossing Flood Control Channel convey runoff from the northern and western half the City. This runoff travels west toward San Jose Creek, where it is eventually conveyed to the Los Angeles Basin. The southern and eastern half of the City is drained by the creeks running through Brea Canyon and Tonner Canyon, which carry water southwest to the Orange County Basin. A small portion of the northeast corner of the City drains towards the east into the Chino Creek Basin (which also reaches the Orange County Basin via the Santa Ana River). All of the runoff water from Diamond Bar eventually reaches the Pacific Ocean.

The following summarizes the major drainage basins and channels in the City and sphere of influence.

**San Jose Creek**
This is a fully improved, regional flood control facility maintained by the Los Angeles County Flood Control District. It collects runoff from most of the east San Gabriel Valley and conveys it into the Los Angeles Basin. It is fed by two local drainage channels; Diamond Bar Creek and the Sunset Crossing Flood Control Channel. Together, these channels drain approximately 45 percent of the City of Diamond Bar.

**Diamond Bar Creek**
This channel enters Diamond Bar near the southern intersection of the 57 and 60 freeways, and travels along the west side of the dual freeway until it reaches the Diamond Bar Golf Course near Grand Avenue. Here it passes under the roadway and drains into the small lake on the north side of Grand Avenue within the golf course. The unimproved channel collects runoff from the lands generally north of Grand Avenue between the 57/60 freeways and the eastern ridgeline of the City. It also drains the following areas:

- Existing residential areas northeast of the 60 Freeway and Golden Springs Drive
- The corporate center on Golden Springs Drive southwest of Grand Avenue.
- The existing mixed use areas west of the 57 Freeway, both south and north of the 60 Freeway within the City limits, and
- The east-facing rolling hills within the City of Industry on the west side of the 60 Freeway.

Diamond Bar Creek is all or partially improved in some locations, such as west of the 60 Freeway, while in other locations, such as near the Diamond Bar Golf Course, it is unimproved. This channel drains over a third (38 percent) of the City of Diamond Bar, and represents the largest local basin.

**Sunset Crossing Flood Control Channel**
This channel is improved as a rectangular concrete channel from the 57 Freeway west to the end of the residential area along Sunset Crossing. From here, the channel is unimproved to San Jose Creek. This channel collects runoff from the residential areas north of the 60 Freeway and west of Golden Springs Drive, along with runoff from both sides of Sunset Crossing, west of the 57 Freeway, and conveys it into the south fork of the San Jose Creek as it passes southwest within the cities of Walnut and Industry. This facility drains approximately 7 percent of the City's land area.

**Brea Canyon Channel**
This creek collects runoff from the developments and slopes along Diamond Bar Boulevard south of Grand Avenue, and conveys it to the southwest towards Orange County. While improved and undergrounded within the developed portions of the City, Brea Canyon Channel becomes an unimproved channel south of Diamond Bar Boulevard and the 57 Freeway. It then follows the historical alignment of Brea Canyon Road. It also drains the areas west of the 57 Freeway south of Pathfinder Road, and all of the canyons on the "front" (northwest-facing) side of "The Country" development. This creek drains approximately 28 percent of the City of Diamond Bar, and is its second largest local drainage basin.

**Chino Creek**
Approximately 5 percent of the City, in the extreme northeast, undeveloped corner of the Tres Hermonos area, drains east toward Chino Creek in the Chino Basin. Runoff from this area eventually reaches Orange County via the Santa Ana River.

**Tonner Canyon Creek**
Just under a quarter of the City of Diamond Bar is drained by the creek flowing through Tonner Canyon. The middle and upper reaches of this natural canyon are located east of the City, although the upper reaches are within the Tres Hermonos area of the City. In addition, much of the middle and lower sections of the canyon are within the City's sphere of influence (the portion north of Orange Los Angeles County line). All of the canyons on the "back" (southeast-facing) side of "The Country" development drain into Tonner Canyon. This channel drains almost a quarter (22 percent) of the City area and two thirds (65 percent) of Tonner Canyon. Flows collected in the canyon meet with Brea Canyon (creek) at the 57 Freeway and travel south into Orange County.

The canyon is also drained by Lions Canyon and Sonome Canyon, two smaller creeks that flow southeast and south, respectively, off of the high ridge along the south side of Tonner Canyon. Runoff from these canyons eventually enters Carbon Canyon Creek in Brea to the south. These two creeks drain approximately the southeastern third (35 percent) of Tonner Canyon.

Existing flood control programs and facilities, for the region as well as within the City of Diamond Bar, have been built by the Los Angeles County Department of Public Works (Anderson 1990). The present system consists of a series of natural channels, storm drains, and improved channels designed to convey runoff in an efficient and safe manner. There are no regional flood control facilities planned within the City, nor are any needed according to the County (LADPW 1985).

The local drainage system is largely complete within the City of Diamond Bar, with only a few projects left to complete the backbone system (Koss 1990). The San Jose Creek represents the major regional collector for runoff for the region. It is a fully improved, trapezoidal concrete channel which transfers storm flows from the east San Gabriel Valley, including much of the urbanized portions of Diamond Bar, into the Los Angeles Basin. At present, no major improved flood control structures serve Tonner or Brea canyons. In most of the upland areas of the City, runoff is first collected by streets and curbs, and then directed toward existing County drainage control structures.

In natural areas, drainage that flows toward the west is generally intercepted by a roadway, where it is then diverted towards a flood control facility. The County system has been designed and installed to collect and transport flood flows that would be produced by development at the density of the Los Angeles County General Plan. While the City General Plan may modify the overall densities or locations of land uses, it is likely that the total amount of land coverage, and thus the amount of runoff generated, will be similar to those levels used to design and build the existing flood control system. Therefore, no significant upgrading or changes should be required to existing or planned drainage facilities within the City (Koss 1990).

**Water/Wastewater Treatment Facilities**
There are no sanitary districts or sewage treatment facilities in the City of Diamond Bar. However, there are 10 sewage pumps and one water district, Walnut Valley Water District.

Agencies installing or replacing water supply or sanitary sewage systems must comply with the provisions of Ordinance 30 (1989) which states: (a) All new and replacement water supply and sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the system and discharge from systems into floodwaters. (b) Onsite waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding. (CD18:12/Ord. No. 30 (1989), &3 (14), 6-19-90)
(See San Gabriel River Major Sub-Watersheds Map – Map 17)

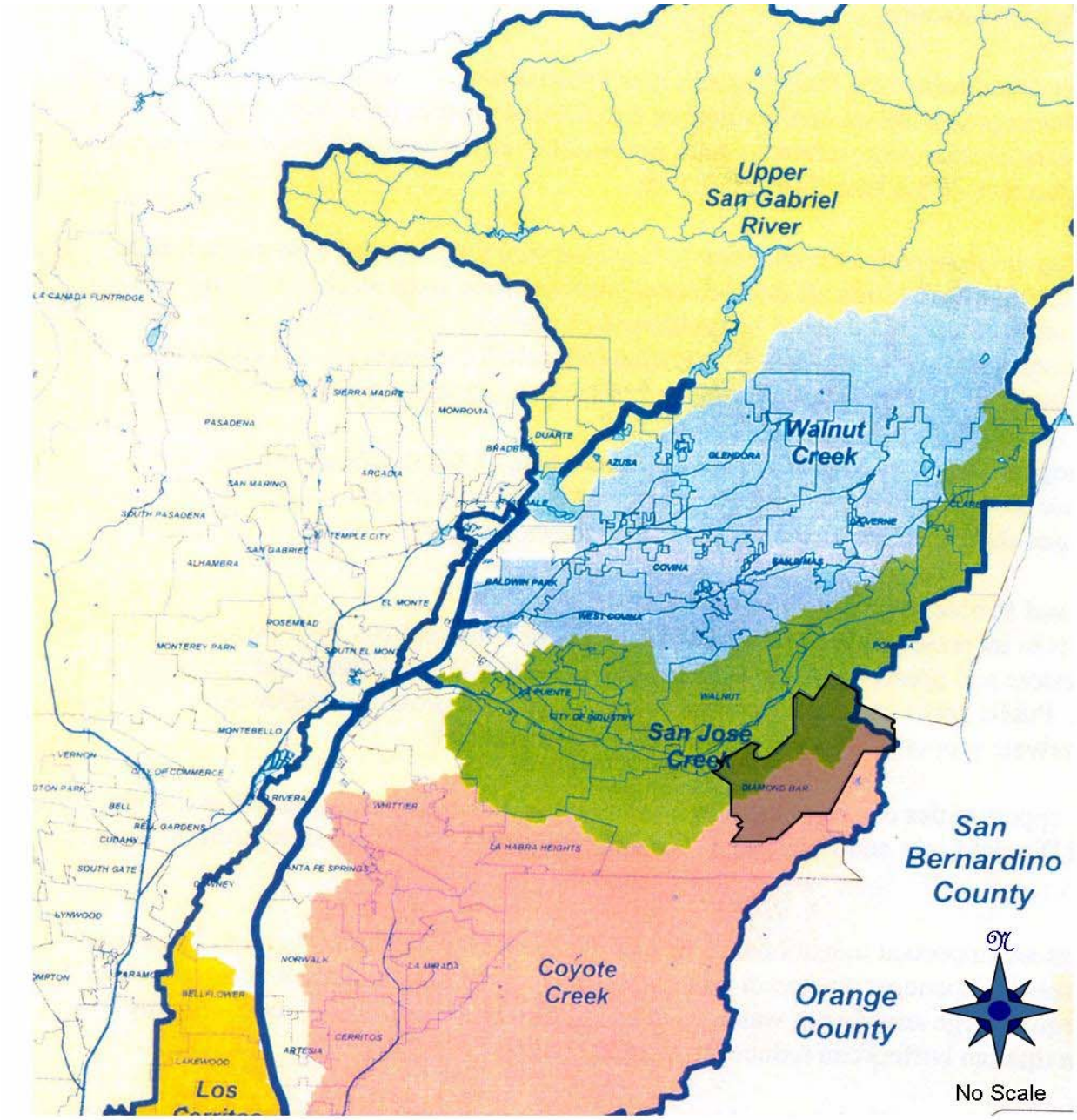
## EXISTING FLOOD MITIGATION ACTIVITIES

The City's current floodplain management regulations are contained in Chapter 18.108 of the Diamond Bar Municipal Code adopted by Ordinance No. 30 (1989). The City of Diamond Bar became a participating city in the National Flood Insurance Act of 1968 via Resolution No. 91-51 and the subsequent approval by FEMA on July 31, 1991. The City has amended the Ordinance to update the minimum NFIP requirements for Floodplain Management.

This includes prohibiting encroachments, including fill, new construction, substantial improvements, and other development unless certification by a registered professional engineer is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

**City of Diamond Bar Codes**
The City of Diamond Bar uses building codes, zoning codes, and various planning strategies to address the goals which aim at restricting development in areas of known hazards, and applying the appropriate safeguards. Standards of construction are applied in all areas of flood hazards and include: Anchoring, construction materials and methods, elevation and flood proofing standards.

**Mitigation Requirements**
In 1999, the City of Diamond Bar updated flood damage prevention regulations, Ordinance No. 30 (1989). With the adoption of the Ordinance, the City became in full compliance with the FEMA regulations. The ordinance adopted amendments to update the Minimum National Flood Insurance Program requirements for floodplain management.




# Map 17
# San Gabriel River Major Sub-Watersheds Map

LEGEND

- Major Channels
- San Gabriel River Watershed
- City of Diamond Bar

Source: Los Angeles County

Since the floodway is an extremely hazardous area due to the velocity of floodwaters which carry debris, potential projectiles, and erosion potential, Ordinance No. 30 (1989) features the following mitigation measures:

- Prohibits encroachments, including fill, new construction, substantial improvements, and other development unless certification by a registered professional engineer is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

- Requires the floodplain administrator to issue permits for proposed construction and other development within all flood-related erosion-prone areas as known to the community. Said permits shall be reviewed to determine whether the proposed site alterations and improvements will be reasonably safe from flood-related erosion and will not cause flood-related erosion hazards or otherwise aggravate the existing hazard; and,

- If a proposed improvement is found to be in the path of flood-related erosion or would increase the erosion hazard, such improvement shall be relocated or adequate protective measures shall be taken to avoid aggravating the existing erosion hazard.

**Acquisition and Protection of Open Space in the Floodplain**

Current efforts to increase public open space in the City of Diamond Bar have been paired with the need to restore and preserve natural systems that provide wildlife habitat and help to mitigate flood events. Public parks and publicly owned open spaces can provide a buffer between flood hazards and private property.

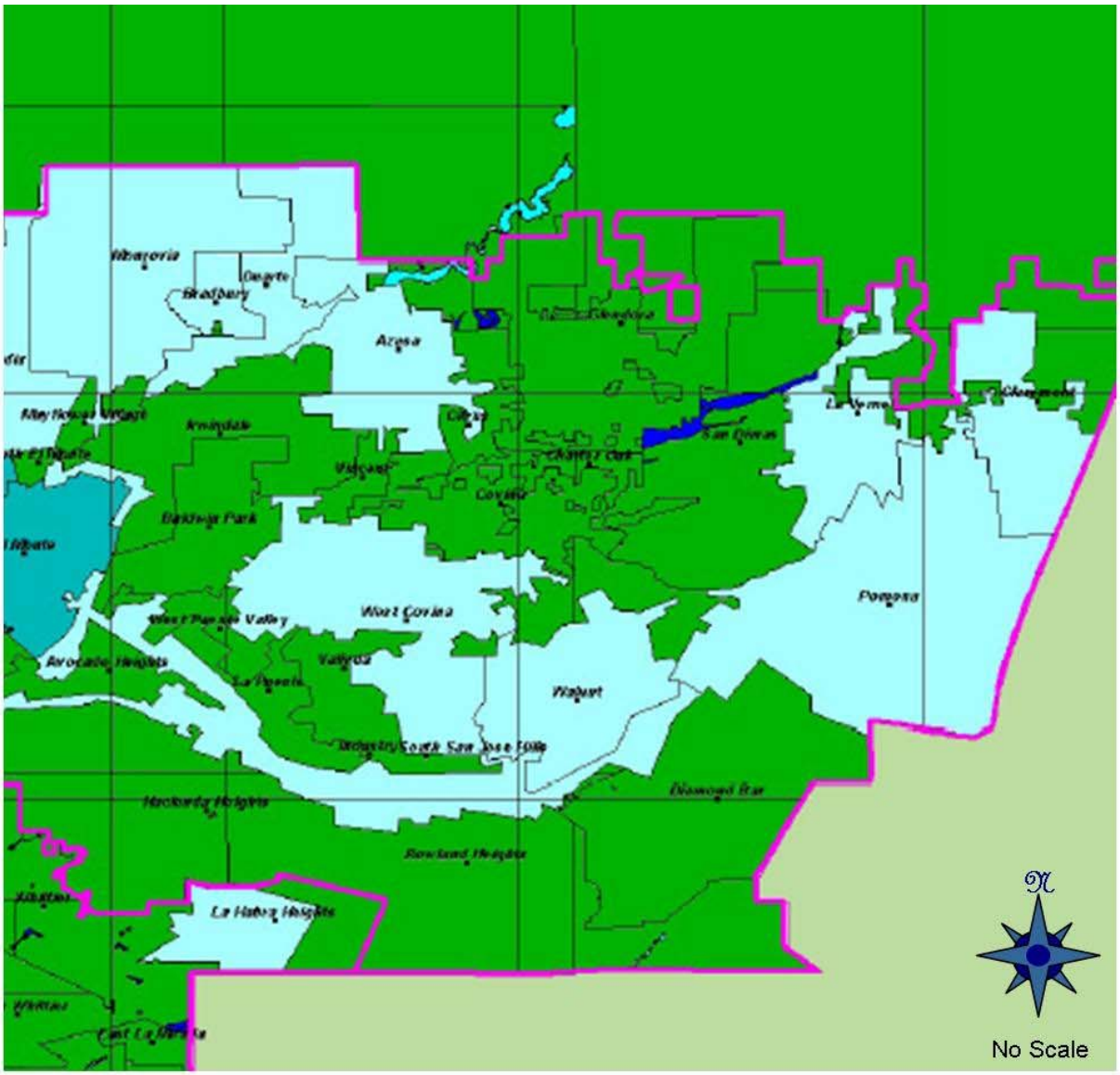
Examples of opportunities can be Sycamore Canyon Park, Peterson Park, Lots 1 & 61, Pulte property and Lighting and Landscape Assessment District #41 which is adjacent to Ronald Reagan Park.

Riparian areas are important transitional areas that link water and land ecosystems. Vegetation in riparian areas is dependent on stream processes, such as flooding, and often is composed of plants that require large amounts of water, such as willows and cottonwood trees. Healthy vegetation in riparian buffers can reduce streamside erosion.

Standard Pacific Homes were developed in a Blue Line stream area. During the development a flood control system was placed and a riparian habitat was set-up in Sycamore Canyon Park. (See FEMA Flood Plain Map –Map 18)

**Wetlands**

Many floodplain and stream-associated wetlands absorb and store storm water flows, which reduces flood velocities and stream bank erosion. Preserving these wetlands reduces flood damage and the need for expensive flood control devices such as levees. When the storms are over, many wetlands augment summer stream flows by slowly releasing the stored water back to the stream system. Wetlands are highly effective at removing nitrogen, phosphorous, heavy metals, and other pollutants from water. For this reason, artificial wetlands are often constructed for cleaning storm water runoff and for tertiary treatment (polishing) of wastewater.




# Map 18
# FEMA Flood Plains Map

LEGEND

- 50 Year Flood Plain
- 100 Year Flood Plain
- 500 Year Flood Plain
- 1000 Year Flood Plain

Source: Los Angeles County

Wetland areas in the City of Diamond Bar include:

- Diamond Bar Boulevard S. of Goldrush. At this area the water from the Pulte development drains into the wetland area.
- Pantera Park – this area drains into Sycamore Canyon Creek.
- Area between Armitos and the 60 freeway. This area drains into the Diamond Bar Creek.

**Stormwater Systems**

There are a variety of surface water management providers in the county that manage water quality and storm water runoff from new development. In addition, under federal regulations issued by the U.S. Environmental Protection Agency, jurisdictions are required to obtain National Pollutant Discharge Elimination System permits in order to improve the quality of storm water and urban discharge. The individual cities are responsible for implementing the permit requirements in their respective jurisdictions, and developing specific strategies ("Best Management Practices") that will improve the quality of urban discharge into storm drains. The City maintains booklets and instructions on BMP's, construction, treatment and detention, and other activities designed to prevent storm water pollution.

The National Pollutant Discharge Elimination System (NPDES) also plays an important role in this area. The NPDES permit program was established under Section 402 of the CWA, which prohibits the unauthorized discharge of pollutants from a point source (pipe, ditch, well, etc.) to U.S. waters, including municipal, commercial, and industrial wastewater discharges and discharges from large animal feeding operations. Permittees must verify compliance with permit requirements by monitoring their effluent, maintaining records, and filing periodic reports.

In 1995, under the 1st Permit the City enacted an Ordinance to implement NPDES efforts in the City of Diamond Bar. Throughout the first Permit, the City began its development of BMP's aimed at educating the commercial and residential sectors on proper water quality measures as required by NPDES. In fact, the City proactively conducted on-site inspections to demonstrate proper measures with face-to-face contact. Lastly, in conducting site visits, the City began enforcement activities aimed at correcting/changing behavior.

The City of Diamond Bar is considered a Phase II city on this permit. In 2000, under the 2nd and current Permit, the City updated its Ordinance to include/reflect new standards. The City continued active enforcement and education efforts that targeted specific Pollutants. Some examples include cigarette butts, motor oil spills, and pesticide usage. Accordingly, the City updated related Contract Service provision such as Street Sweeping to collect polluting debris, Automated Trash containers with necessary enclosures to prevent debris, and began hosting Composting Workshops on the proper usage of pesticides.

In 2001, the City implemented the SUSMP (Standard Urban Storm Water Mitigation Plan) to extend the 2nd Permit's goals to New Development and Redevelopment Projects that meet certain criteria (i.e. size, potential for Environmental Impacts, etc.) in the City of Diamond Bar.

## COMMUNITY ISSUES SUMMARY

The City of Diamond Bar works to mitigate problems regarding flood issues when they arise. Some areas in the City of Diamond Bar are more susceptible to flooding issues. The City's

Public Works Division has documented the problem areas in the community, and continues efforts to mitigate problems. These problems are minor and do not affect any of the residential areas. In addition, rather than labeling it as a flooding problem, it is best described as a storm runoff problem area.

**Locations of Identified Problems Areas**
Villa Sorella cul-de-sac – an existing v-ditch adjacent to properties clogged and the water was diverting into the parking lot. Temporary mitigation when this occurred was to use sandbags. The city later graded the dirt area to divert water away from backside properties on Davan Street and Farel Avenue. Since then no storm water runoff areas have occurred in this area.

Diamond Bar Boulevard & Steep Canyon Road – during heavy rains the area may flood due to the steep grade of Steep Canyon Road. A recent housing development in the area was required to install v-ditches and drains to move the water away from the intersection. Also, to mitigate any water that may form at the intersection, flood barricade warning signs are placed to warn drivers.

## FLOOD MITIGATION ACTION ITEMS

The flood mitigation action items provide direction on specific activities that organizations and residents in the City of Diamond Bar can undertake to reduce risk and prevent loss from flood events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

The General Plan identified the City's need to develop policies to minimize the threat to its citizens from flooding, and establish a schedule of improvements based on an updated master plan of drainage. As part of these policies, specific standards for protection from various size storms (10-, 25-, 50-, 100-, and 500-year) are needed. (GP-PH&SE IV-7). No timeline has been developed due to the small flood risk to which residents are exposed.

The General Plan also stated that future residents of the City may be exposed to an incremental threat from flooding as new development occurs and increased runoff is created. There was potential for increased flooding along the unimproved Reed Creek Channel along areas at Brea Canyon Road. When the area was developed there was work on the flood control channel which completed the mitigated item.

> **Mitigation Action 6.3: Flood Prevention.** Maintain routine maintenance of down and bench drains in and around residential and commercial areas to avoid accumulation of debris which could lead to dangerous and destructive flooding.
>
> **Goals and Objective Implemented:** 1 and 5.
> **Hazards Addressed:** Floods
> **Lead Department:** Public Works, LA County Flood Control District, LA County Sanitation District
> **Priority:** One

---

1. http://www.fema.gov/rrr/talkdiz/landslide.shtm#what

# SECTION 9: WILDFIRE

For thousands of years, fires have been a natural part of the ecosystem in Southern California. However, wildfires present a substantial hazard to life and property in communities built within or adjacent to hillsides and mountainous areas. There is a huge potential for losses due to wildland/urban interface fires in Southern California. According to the California Division of Forestry (CDF), there were over seven thousand reportable fires in California in 2003, with over one million acres burned.[1] According to CDF statistics, in the October 2003 Firestorms, over 4,800 homes were destroyed and 22 lives were lost.[2]

## Wildfires

In the endeavor to protect life and property within the boundaries of the County of Los Angeles the Fire Department relies upon several key factors in addressing wildfire hazards:

## Diamond Bar Wildfire Threat

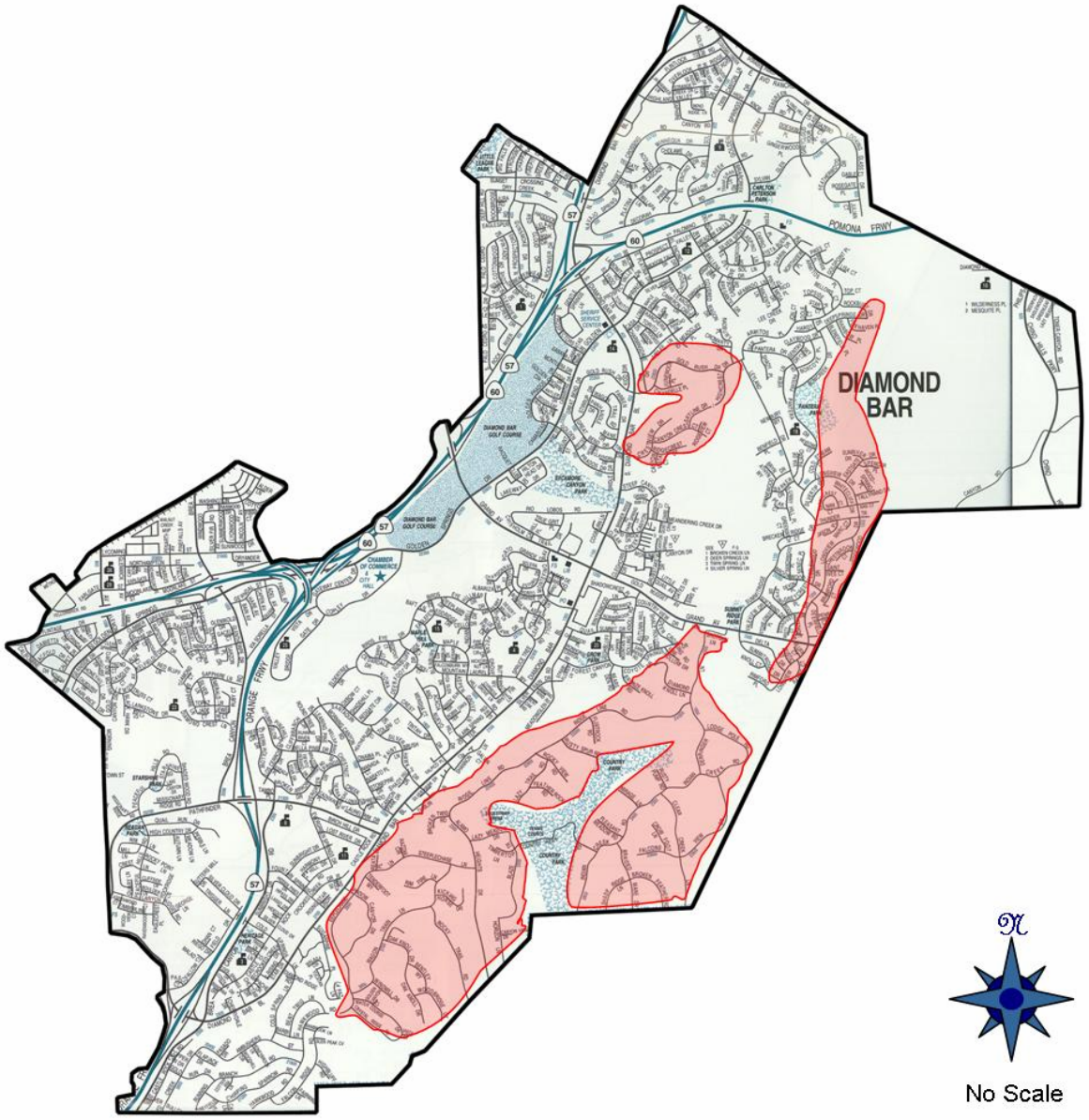
Diamond Bar's geographic location coupled with the City's aggressive compliance with building and fire codes significantly reduces the threat of wide-scale wildfire loss. (See Disaster Management Area D Historic Fire Areas – Map 19)

## Fire Department Organization

The Los Angeles County Fire Department is a line and staff organization. Field operations are organized into 3 Bureaus, 8 divisions and 20 battalions. Within the city limits of Diamond Bar there are 3 designated fire stations and 3 fire stations in the adjacent cities of Pomona and Walnut that are assigned to work as first responders within the City of Diamond Bar. These 6 stations are designated Battalion 19, Division VIII. Battalion 19's other two Battalions in Division VIII are 15 and 12. Division VIII has a combined total of 19 fire stations. This organizational structure provides a depth of personnel and equipment that ensures maximum emergency incident response capability.

## The 2003 Southern California Fires

The fall of 2003 marked the most destructive wildfire season in California history. In a ten day period, 12 separate fires raged across Southern California in Los Angeles, Riverside, San Bernardino, San Diego and Ventura counties. The massive "Cedar" fire in San Diego County alone consumed of 2,800 homes and burned over a quarter of a million acres.




# Map 19
# Potential Fire Hazard Map

LEGEND

Potential Fire Hazard

Golf Course and Park Areas

Table 8-1. October 2003 Firestorm Statistics

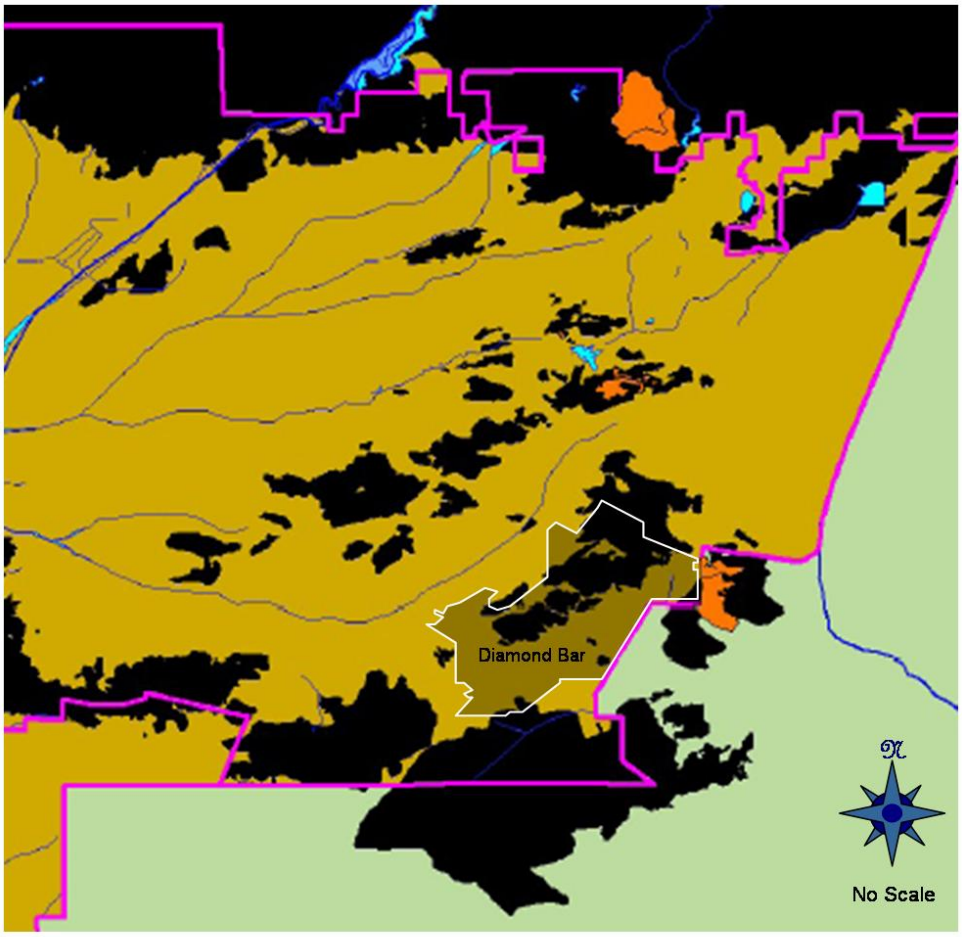
| County | Fire Name | Date Began | Acres Burned | Homes Lost | Homes Damaged | Lives Lost |
|---|---|---|---|---|---|---|
| Riverside | Pass | 10/21/03 | 2,397 | 3 | 7 | 0 |
| Los Angeles | Padua | 10/21/03 | 10,446 | 59 | 0 | 0 |
| San Bernardino | Grand Prix | 10/21/03 | 69,894 | 136 | 71 | 0 |
| San Diego | Roblar 2 | 10/21/03 | 8,592 | 0 | 0 | 0 |
| Ventura | Piru | 10/23/03 | 63,991 | 8 | 0 | 0 |
| Los Angeles | Verdale | 10/24/03 | 8,650 | 1 | 0 | 0 |
| Ventura | Simi | 10/25/03 | 108,204 | 300 | 11 | 0 |
| San Diego | Cedar | 10/25/03 | 273,246 | 2,820 | 63 | 14 |
| San Bernardino | Old | 10/25/03 | 91,281 | 1,003 | 7 | 6 |
| San Diego | Otay / Mine | 10/26/03 | 46,000 | 6 | 11 | 0 |
| Riverside | Mountain | 10/26/03 | 10,000 | 61 | 0 | 0 |
| San Diego | Paradise | 10/26/03 | 56,700 | 415 | 15 | 2 |
| Total Losses | | | 749,401 | 4,812 | 185 | 22 |

Source: http://www.fire.ca.gov/php/fire_er_content/downloads/2003LargeFires.pdf

**Historic Fires in Southern California**

Large fires have been part of the Southern California landscape for millennia. "Written documents reveal that during the 19th century human settlement of southern California altered the fire regime of coastal California by increasing the fire frequency. This was an era of very limited fire suppression, and yet like today, large crown fires covering tens of thousands of acres were not uncommon. One of the largest fires in Los Angeles County (60,000 acres) occurred in 1878, and the largest fire in Orange County's history, in 1889, was over half a million acres."[3]

(See Disaster Management Area D Historic Fire Areas – Map 20)




# Map 20
# Area "D" Historic Fire Areas Map

LEGEND

- Historic Burn Areas 1878-1996 (Consistent Fire Damage Areas)
- Urban Areas
- Proscribed Burn Areas, Manmade Fire Prevention Projects
- City of Diamond Bar

Source: Los Angeles County

Table 8-2. Large Historic Fires in California 1961-2003
20 Largest California Wildland Fires (Structures Destroyed)

| | Fire Name | Date | County | Acres | Structures | Deaths |
|---|---|---|---|---|---|---|
| 1 | Tunnel | October 1991 | Alameda | 1,600 | 2,900 | 25 |
| 2 | Cedar | October 2003 | San Diego | 273,246 | 2,820 | 14 |
| 3 | Old | October 2003 | San Bernardino | 91,281 | 1,003 | 6 |
| 4 | Jones | October 1999 | Shasta | 26,200 | 954 | 1 |
| 5 | Paint | June 1990 | Santa Barbara | 4,900 | 641 | 1 |
| 6 | Fountain | August 1992 | Shasta | 63,960 | 636 | 0 |
| 7 | City of Berkeley | September 1923 | Alameda | 130 | 584 | 0 |
| 8 | Bel Air | November 1961 | Los Angeles | 6,090 | 484 | 0 |
| 9 | Laguna Fire | October 1993 | Orange | 14,437 | 441 | 0 |
| 10 | Paradise | October 2003 | San Diego | 56,700 | 415 | 2 |
| 11 | Laguna | September 1970 | San Diego | 175,425 | 382 | 5 |
| 12 | Panorama | November 1980 | San Bernardino | 23,600 | 325 | 4 |
| 13 | Topanga | November 1993 | Los Angeles | 18,000 | 323 | 3 |
| 14 | 49er | September 1988 | Nevada | 33,700 | 312 | 0 |
| 15 | Simi | October 2003 | Ventura | 108,204 | 300 | 0 |
| 16 | Sycamore | July 1977 | Santa Barbara | 805 | 234 | 0 |
| 17 | Canyon | September 1999 | Shasta | 2,580 | 230 | 0 |
| 18 | Kannan | October 1978 | Los Angeles | 25,385 | 224 | 0 |
| 19 | Kinneloa | October 1993 | Los Angeles | 5,485 | 196 | 1 |
| 19 | Grand Prix | October 2003 | San Bernardino | 59,448 | 196 | 0 |
| 20 | Old Gulch | August 1992 | Calaveras | 17,386 | 170 | 0 |

http://www.fire.ca.gov/FireEmergencyResponse/HistoricalStatistics/PDF/20LSTRUCTURES.pdf

"Structures" is meant to include all loss - homes and outbuildings, etc.

During the 2002 fire season, more than 6.9 million acres of public and private lands burned in the US, resulting in loss of property, damage to resources and disruption of community services.[4] Taxpayers spent more than $1.6 billion[5] to combat more than 88,400 fires nationwide. Many of these fires burned in wildland/urban interface areas and exceeded the fire suppression capabilities of those areas. Table 8-3 illustrates fire suppression costs for state, private and federal lands. See Map 20, Page 145 for Area "D" Historic Fire Areas.

Table 8-3. National Fire Suppression Costs

| Year | Suppression Costs | Acres Burned | Structures Burned |
|---|---|---|---|
| 2000 | $1.3 billion | 8,422,237 | 861 |
| 2001 | $0.5 billion | 3,570,911 | 731 |
| 2002 | $1.6 billion | 6,937,584 | 815 |

http://research.yale.edu/gisf/assets/pdf/ppf/wildfire_report.pdf

**WHY ARE WILDFIRES A THREAT TO CITY OF DIAMOND BAR?**

Wildfires are a serious threat to the City of Diamond Bar and to most communities throughout California. From the Sierra Nevada's to the Sonora Desert and from the Tahoe Basin to the Malibu Hills, among the many hazards Californians face is a particularly complex fire environment, with a wide array of climates, fuels and topographies, each presenting a host of unique challenges.

The danger of wildfires to California's communities is nothing new. In 1991, the Oakland Hills fires in northern California claimed 25 lives and destroyed nearly 3,200 homes at an insured cost of about $1.7 billion. In 1993, two major fires in Laguna and Malibu destroyed 1,000 homes over 26 miles and caused over $550 million in damages. Some experts have speculated that once all the damages from the California Wildfires of 2003 are tabulated (provisionally estimated at about $1.7-$3.5 billion); it may rival the costliest fire incident in California's history, which occurred following the 1906 San Francisco Earthquake, which caused $5.7 billion in damages, in inflation-adjusted dollars.

Fire risk in southern California is determined by a number of factors, including drought, the availability and type of fuels, the Santa Ana Winds and development in the wildland-urban interface. The area is characterized by a Mediterranean-style climate of hot, dry summers and mild wet winters. As with much of the West, the region has seen significantly below average rainfalls in recent years, leaving parched brush and trees extremely dry and fire prone. Many brush plants in southern California's chaparral seed quickly; leaving dead vegetation that is rich in nutrients, which are released into the soil by burning. Indeed, some chaparral plants, such as Ceanothus, have leaves that are coated with flammable resins, while others such as Chamise (greasewood), not only produce volatile gases when they burn, but also leave a water-resistant residue in the soil that prevents water absorption, which accelerates erosion on denuded slopes, increasing post-fire risks of flash flooding and mudslides in area communities.

Vegetation that can fuel wildland fires in California grows lushly in the moist winters, only to be dried by Santa Ana winds after the generally arid summer months. The Santa Ana winds blow from the inland deserts in the northeast towards the Pacific Ocean. They blow with exceptional speed below the passes and trough canyons of southern California and in the Los Angeles basin. Commonly associated with bad fortune in local ore, the Santa Ana prove a most "ill wind" to firefighters trying to contain a wildland fire and as in several of the blazes of the California Wildfires of 2003, can quickly transform a small brushfire into a raging firestorm.

In addition, the development of communities in the urban-wildland interface poses challenges for developing an effective and comprehensive fire management program. While local building codes have developed over time to encourage more fire-resistant construction, older buildings pose a challenge to local communities. Vegetation control is another issue, as well as the palm trees, eucalyptus and other oily landscaping plants common in southern California, which can add fuel to a rapidly moving fire.

According to the National Interagency Fire Center (NIFC), 57,578 wilderness fires were identified in 2003, burning over three million acres, mostly in remote and sparsely populated areas of the American West. As remarkable as that sounds, 2003 was on the whole a slow year for wildfires. According to the NIFC, an average of 97,000 wildfires has burned nearly 5 million acres annually each year in the past decade.

The best estimate of direct and indirect costs of Wildfire damage in the United States range between $1 and $2 billion annually. California has had significant number of locations impacted by Wildfires. Some Wildfires result in private property damage; other Wildfires impact transportation corridors, fuel and energy conduits, and communication facilities. They can also pose a serious threat to human life.

On October 21, 2003, wildfires broke out in the Reche Canyon area of Riverside County, outside Fontana in San Bernardino County, at Camp Pendleton, north of San Diego and in the hills above Burbank in Los Angeles County. Helped along by unseasonably warm weather and the Santa Ana winds, the fires multiplied, rapidly burning thousands of acres, as Federal, State and local firefighters were deployed to fight the blazes. In all 12 separate fires in 5 counties would eventually make up the California Wildfires of 2003, burning 750,000 acres and destroying 3,631 homes, claiming 24 lives and causing 222 injuries.

In Los Angeles County, the Padua Fire was an outgrowth of the massive Grand prix Fire, which began on October 21, 2003, in neighboring San Bernardino County. It destroyed 59 homes and consumed 10,466 acres, mostly in the Angeles National Forest before being contained on November 5, 2003. The Verdale Fire started on October 25, 2003, in Los Angels, threatening over 350 residences and 40 businesses in the towns of Val Verde and Piru, as well as major electrical transmission lines and an oil field in its path. A suspected arson, the Verdale Fire burned approximately 8,680 acres before being contained on October 29, 2003.

## WILDFIRE CHARACTERISTICS

### What is a Wildfire?

A Wildfire is defined as, a sweeping and destructive conflagration especially in a wilderness or rural area, an undesirable fire occurring in the natural environment. About 90% of wildfires are started by humans; the other 10% are started by lightning. Three components are necessary to start a fire: oxygen, fuel and heat.

Weather is one of the most significant factors in determining the severity of wildland fires. The intensity of fires and the rate with which they spread is directly related to the wind speed, temperature and relative humidity. Climatic conditions such as long term drought also play a major role in the number and intensity of wildfires.

Fire is an essential component of healthy forest ecosystems, periodically clearing areas of brush, undergrowth and dead trees, creating seedbeds for new growth. While many wildland fires are caused naturally by lighting strikes, they are far too often manmade as well, sparked by either accident or arson. Almost any day of the year, a wildland fire is burning somewhere in the United States. But as with flooding, wildland fires can pose a significant disaster risk to lives and property whenever patterns of land use and development find themselves in the path of nature.

Over the past century, conventional wisdom has held that fires should be aggressively controlled. During this period, land management policy has been shaped by constructive dialogue seeking to establish the best possible balance between economic development and environmental conservation. However, massive accumulations of dead vegetation, brush and undergrowth have been identified by many forestry experts as posing an increased fire risk, particularly to communities near forested areas in what is commonly called the "wildland-urban interface."

## WILDFIRE CONDITIONS

Wildland fires in hills covered with chaparral are often a precursor to debris flows in burned out canyons. The extreme heat of a wildfire can create a soil condition in which the earth becomes impervious to water by creating a waxy-like layer just below the ground surface. Since the water cannot be absorbed into the soil, it rapidly accumulates on slopes, often gathering loose particles of soil in to a sheet of mud and debris. Debris flows can often originate miles away from unsuspecting persons, and approach them at a high rate of speed with little warning.

## WILDFIRE CHARACTERISTICS

There are three categories of interface fire:[6] The classic wildland/urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas; the mixed wildland/urban interface is characterized by isolated homes, subdivisions and small communities situated predominantly in wildland settings; and the occluded wildland/urban interface exists where islands of wildland vegetation occur inside a largely urbanized area. Certain conditions must be present for significant interface fires to occur. The most common conditions include: hot, dry and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, several conditions influence its behavior, including fuel topography, weather, drought and development.

Southern California has two distinct areas of risk for wildland fire. The foothills and lower mountain areas are most often covered with scrub brush or chaparral. The higher elevations of mountains also have heavily forested terrain. The lower elevations covered with chaparral create one type of exposure.

> "Past fire suppression is not to blame for causing large scrubland wildfires, nor has it proven effective in halting them." said Dr. Jon Keeley, a USGS fire researcher who studies both southern California scrublands and Sierra Nevada forests. "Under Santa Ana conditions, fires carry through all chaparral regardless of age class. Therefore, prescribed burning programs over large areas to remove

> old stands and maintain young growth as bands of firebreaks resistant to ignition are futile at stopping these wildfires."[7]

The higher elevations of Southern California's mountains are typically heavily forested. The magnitude of the 2003 fires is the result of three primary factors: (1) severe drought, accompanied by a series of storms that produce thousands of lightning strikes and windy conditions; (2) an infestation of bark beetles that has killed thousands of mature trees; and (3) the effects of wildfire suppression over the past century that has led to buildup of brush and small diameter trees in the forests.

> "When Lewis and Clark explored the Northwest, the forests were relatively open, with 20 to 25 mature trees per acre. Periodically, lightning would start fires that would clear out underbrush and small trees, renewing the forests.
>
> Today's forests are completely different, with as many as 400 trees crowded onto each acre, along with thick undergrowth. This density of growth makes forests susceptible to disease, drought and severe wildfires. Instead of restoring forests, these wildfires destroy them and it can take decades to recover. This radical change in our forests is the result of nearly a century of well-intentioned but misguided management."[8]

**Fire Prevention Methodology**

Within city limits the Department conducts routine annual fire prevention inspections at all commercial and public occupancies. New or remodeled occupancies will be inspected prior to final authorization for occupancy or use.

The basis for the Department's (fire) fire prevention program is the County of Los Angeles 2004 Fire Code, Title 32 of the Los Angeles County Code, adopting by reference portions of the 2002 edition of the Uniform Fire Code of the International Fire Code Institute and Western Fire Chiefs Association and the International Conference of Building Officials, County Ordinance No. 02-0044.

Vegetative brush inspections are also conduced annually by the Brush Clearance Unit to act as a liaison between the fire stations with brush inspections responsibilities and the weed Abatement Division of the County Agricultural Commissioner/Weights and measures. The intent of the Brush unit is to send a strong message to the public that the Department takes an aggressive approach towards brush clearance. Ornamental vegetation is important in the spread of wildfire. Proper maintenance of brush includes inspections, hazard identifications, fuel modification plans, and administrative enforcement.

Public fire prevention messages are communicated via fire station tours, demonstrations at schools and civic group activities.

**Fire Department Wildland Training**

The Los Angeles County Fire Department conducts training daily, monthly and seasonally on specific types of emergency incidents. Wildfire training begins every spring in Diamond Bar with emphasis on tactics and strategy, manipulative skills and interfacing with cooperative agencies.

**Cooperating Agencies**

The Los Angeles County Fire Department works cooperatively with federal, state and local agencies in the sharing of resources to mitigate public safety hazards such as wildfires. The Department, annually revises automatic-aid agreements, reviews initial action zones and in the case of Diamond Bar meets with cooperating agencies in the Mutual Threat Zone (East and South city limits) to train and discuss operational procedures.

**The Interface**

One challenge Southern California faces regarding the wildfire hazard is from the increasing number of houses being built on the urban/wildland interface. Every year the growing population has expanded further and further into the hills and mountains, including forest lands. The increased "interface" between urban/suburban areas and the open spaces created by this expansion has produced a significant increase in threats to life and property from fires and has pushed existing fire protection systems beyond original or current design and capability. Property owners in the interface are not aware of the problems and threats they face. Therefore, many owners have done very little to manage or offset fire hazards or risks on their own property. Furthermore, human activities increase the incidence of fire ignition and potential damage.

**Fuel**

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is classified by volume and by type. Volume is described in terms of "fuel loading," or the amount of available vegetative fuel.

The type of fuel also influences wildfire. Chaparral is a primary fuel of Southern California wildfires. Chaparral habitat ranges in elevation from near sea level to over 5,000' in Southern California. Chaparral communities experience long dry summers and receive most of their annual precipitation from Winter rains. Although chaparral is often considered as a single species, there are two distinct types; hard chaparral and soft chaparral. Within these two types are dozens of different plants, each with its own particular characteristics.

"Fire has been important in the life cycle of chaparral communities for over 2 million years; however, the true nature of the "fire cycle" has been subject to interpretation. In a period of 750 years, it generally thought that fire occurs once every 65 years in coastal drainages and once every 30 to 35 years inland."[9]

> "The vegetation of chaparral communities has evolved to a point it requires fire to spawn regeneration. Many species invite fire through the production of plant materials with large surface-to-volume ratios, volatile oils and through periodic die-back of vegetation. These species have further adapted to possess special reproductive mechanisms following fire. Several species produce vast quantities of seeds which lie dormant until fire triggers germination The parent plant which produces these seeds defends itself from fire by a thick layer of bark which allows enough of the plant to survive so that the plant can crown sprout following the blaze. In general, chaparral community plants have adapted to fire through the following methods; a) fire induced flowering; b) bud production and sprouting subsequent to fire; c) in-soil seed storage and fire stimulated germination; and d) on plant seed storage and fire stimulated dispersal."[10]

An important element in understanding the danger of wildfire is the availability of diverse fuels in the landscape, such as natural vegetation, manmade structures and combustible materials. A house surrounded by brushy growth rather than cleared space allows for greater continuity of fuel and increases the fire's ability to spread. After decades of fire suppression "dog-hair" thickets have accumulated, which enable high intensity fires to flare and spread rapidly.

**Topography**

Topography influences the movement of air, thereby directing a fire course. For example, if the percentage of uphill slope doubles, the rate of spread in wildfire will likely double. Gulches and canyons can funnel air and act as chimneys, which intensify fire behavior and cause the fire to spread faster. Solar heating of dry, south-facing slopes produces up slope drafts that can complicate fire behavior. Unfortunately, hillsides with hazardous topographic characteristics are also desirable residential areas in many communities. This underscores the need for wildfire hazard mitigation and increased education and outreach to homeowners living in interface areas.

**Weather**

Weather patterns combined with certain geographic locations can create a favorable climate for wildfire activity. Areas where annual precipitation is less than 30 inches per year are extremely fire susceptible.[11] High-risk areas in Southern California share a hot, dry season in late summer and early fall when high temperatures and low humidity favor fire activity. The so-called "Santa Ana" winds, which are heated by compression as they flow down to Southern California from Utah, create a particularly high risk, as they can rapidly spread what might otherwise be a small fire.

**Drought**

Recent concerns about the effects of climate change, particularly drought, are contributing to concerns about wildfire vulnerability. The term drought is applied to a period in which an unusual scarcity of rain causes a serious hydrological imbalance. Unusually dry winters, or significantly less rainfall than normal, can lead to relatively drier conditions and leave reservoirs and water tables lower. Drought leads to problems with irrigation and may contribute to additional fires, or additional difficulties in fighting fires.

Development

Growth and development in scrubland and forested areas is increasing the number of human-made structures in Southern California interface areas. Wildfire has an effect on development, yet development can also influence wildfire. Owners often prefer homes that are private, have scenic views, are nestled in vegetation and use natural materials. A private setting may be far from public roads, or hidden behind a narrow, curving driveway. These conditions, however, make evacuation and fire fighting difficult. The scenic views found along mountain ridges can also mean areas of dangerous topography. Natural vegetation contributes to scenic beauty, but it may also provide a ready trail of fuel leading a fire directly to the combustible fuels of the home itself.

## WILDFIRE HAZARD IDENTIFICATION

Wildfire hazard areas are commonly identified in regions of the wildland/urban interface. Ranges of the wildfire hazard are further determined by the ease of fire ignition due to natural or

human conditions and the difficulty of fire suppression. The wildfire hazard is also magnified by several factors related to fire suppression/control such as the surrounding fuel load, weather, and topography and property characteristics. Generally, hazard identification rating systems are based on weighted factors of fuels, weather and topography.

Table 8- Illustrates a rating system to identify wildfire hazard risk (with a score of 3 equaling the most danger and a score of 1 equaling the least danger.)

Table 8-4. Sample Hazard Identification Rating System

| Category | Indicator | Rating |
|---|---|---|
| Roads and Signage | Steep; narrow; poorly signed | 3 |
| | One or two of the above | 2 |
| | Meets all requirements | 1 |
| Water Supply | None, except domestic | 3 |
| | Hydrant, tank, or pool over 500 feet away | 2 |
| | Hydrant, tank, or pool within 500 feet | 1 |
| Location of the Structure | Top of steep slope with brush/grass below | 3 |
| | Mid-slope with clearance | 2 |
| | Level with lawn, or watered groundcover | 1 |
| Exterior Construction | Combustible roofing, open eaves, Combustible siding | 3 |
| | One or two of the above | 2 |
| | Non-combustible roof, boxed eaves, non-combustible siding | 1 |

In order to determine the "base hazard factor" of specific wildfire hazard sites and interface regions, several factors must be taken into account. Categories used to assess the base hazard factor include:

Topographic location, characteristics and fuels;
Site/building construction and design;
Site/region fuel profile (landscaping);
Defensible space;
Accessibility;
Fire protection response; and
Water availability.

The use of Geographic Information System (GIS) technology in recent years has been a great asset to fire hazard assessment, allowing further integration of fuels, weather and topography data for such ends as fire behavior prediction, watershed evaluation, mitigation strategies and hazard mapping.

## VULNERABILITY AND RISK

Southern California residents are served by a variety of local fire departments as well as county, state and federal fire resources. Data that includes the location of interface areas in the county can be used to assess the population and total value of property at risk from wildfire and direct these fire agencies in fire prevention and response.

Key factors included in assessing wildfire risk include ignition sources, building materials and design, community design, structural density, slope, vegetative fuel, fire occurrence and weather, as well as occurrences of drought.

The National Wildland/Urban Fire Protection Program has developed the Wildland/Urban Fire Hazard Assessment Methodology tool for communities to assess their risk to wildfire. For more information on wildfire hazard assessment refer to http://www.Firewise.org.

## COMMUNITY WILDFIRE ISSUES

## WHAT IS SUSCEPTIBLE TO WILDFIRE?

### Growth and Development in the Interface

The hills and mountainous areas of Southern California are considered to be interface areas. The development of homes and other structures is encroaching onto the wildlands and is expanding the wildland/urban interface. The interface neighborhoods are characterized by a diverse mixture of varying housing structures, development patterns, ornamental and natural vegetation and natural fuels.

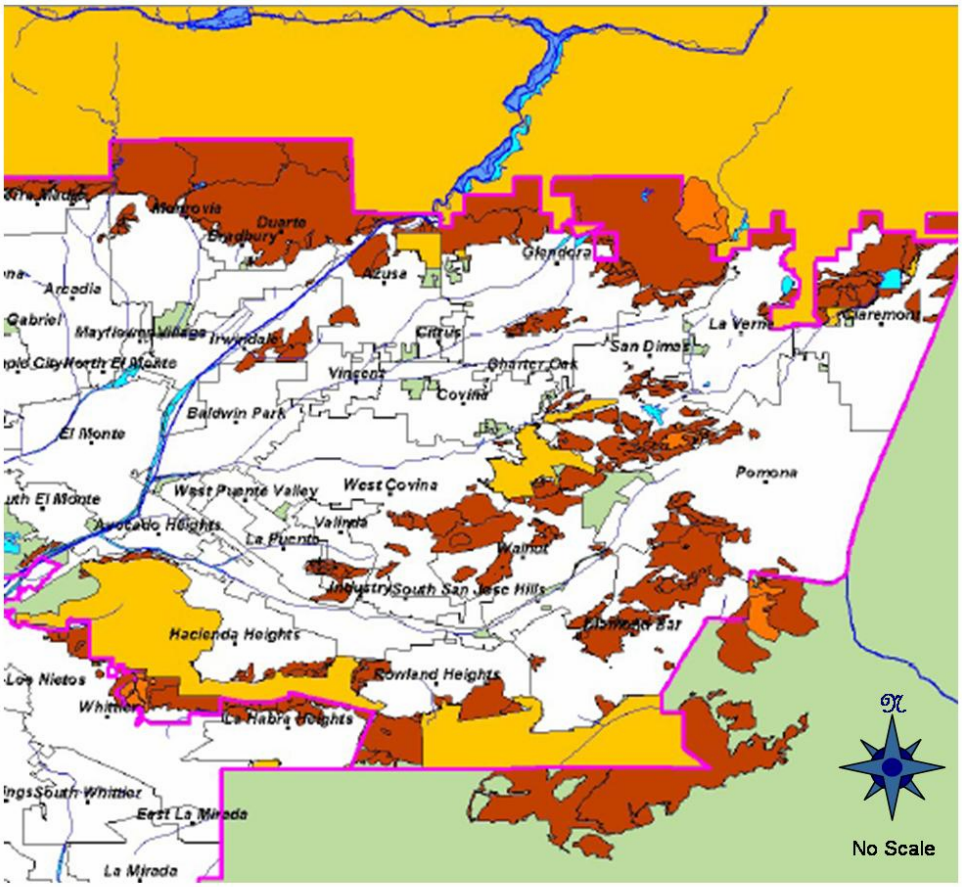
(See Los Angeles County Disaster Management Area D Fire Hazards Map – Map 21)

In the event of a wildfire, vegetation, structures and other flammables can merge into unwieldy and unpredictable events. Factors important to the fighting of such fires include access, firebreaks, proximity of water sources, distance from a fire station and available firefighting personnel and equipment. Reviewing past wildland/urban interface fires shows that many structures are destroyed or damaged for one or more of the following reasons:

Combustible roofing material;
Wood construction;
Structures with no defensible space;
Fire department with poor access to structures;
Subdivisions located in heavy natural fuel types;
Structures located on steep slopes covered with flammable vegetation;
Limited water supply; and
Winds over 30 miles per hour.

### Road Access

Road access is a major issue for all emergency service providers. As development encroaches into the rural areas of the county, the number of houses without adequate turn-around space is increasing. In many areas, there is not adequate space for emergency vehicle turnarounds in




# Map 21
# Area "D" Fire Hazards Map

LEGEND

- Wild Land/Urban Interface Areas High Fire Risk
- Wild Land Extreme Fire Risk
- Proscribed Burn Areas, Manmade Fire Prevention Projects
- Unincorporated Urban Interface Areas

Source: Los Angeles County

single-family residential neighborhoods, causing emergency workers to have difficulty doing their jobs because they cannot access houses. As fire trucks are large, firefighters are challenged by narrow roads and limited access, When there is inadequate turn around space, the fire fighters can only work to remove the occupants, but cannot safely remain to save the threatened structures.

**Water Supply**
Fire fighters in remote and rural areas are faced by limited water supply and lack of hydrant taps. Rural areas are characteristically outfitted with small diameter pipe water systems, inadequate for providing sustained fire fighting flows.

**Interface Fire Education Programs and Enforcement**
Fire protection in urban/wildland interface areas may rely heavily more on the landowner's personal initiative to take measures to protect his or her own property. Therefore, public education and awareness may play a greater role in interface areas. In those areas with strict fire codes, property owners who are resist maintaining the minimum brush clearances may be cited for failure to clear brush.

**The Need for Mitigation Programs**
Continued development into the interface areas will have growing impacts on the wildland/urban interface. Periodically, the historical losses from wildfires in Southern California have been catastrophic, with deadly and expensive fires going back decades. The continued growth and development increases the public need for natural hazards mitigation planning in Southern California.

## WILDFIRE MITIGATION ACTIVITIES

Existing mitigation activities include current mitigation programs and activities that are being implemented by county, regional, state, or federal agencies or organizations.

**Local Programs**
In Southern California there are dozens of independent local fire departments as well as large county wide consolidated fire districts. Although each district or department is responsible for fire related issues in specific geographic areas, they work together to keep Southern California residents safe from fire. Although fire agencies work together to fight urban/wildland interface fires, each separate agency may have a somewhat different set of codes to enforce for mitigation activities.

The fire departments and districts provide essential public services in the communities they serve and their duties far surpass extinguishing fires. Most of the districts and departments provide other services to their jurisdictions, including Emergency Medical Services who can begin treatment and stabilize sick and injured patients in emergency situations. All of the fire service providers in the county are dedicated to fire prevention and use their resources to educate the public to reduce the threat of the fire hazard, especially in the wildland/urban interface. Fire prevention professionals throughout the county have taken the lead in providing many useful and educational services to Southern California residents, such as:

Home fire safety inspection;
Assistance developing home fire escape plans;
Business Inspections;
Citizen Emergency Response Team (CERT) training;
Fire cause determination;
Counseling for juvenile fire-setters;
Teaching fire prevention in schools;
Coordinating educational programs with other agencies, hospitals and schools; and
Answering citizens' questions regarding fire hazards.

**The Threat of Urban Conflagration**

Although communities without an urban/wildland interface are much less likely to experience a catastrophic fire, in Southern California there is a scenario where any community might be exposed to an urban conflagration similar to the fires that occurred following the 1906 San Francisco earthquake.

> "Large fires following an earthquake in an urban region are relatively rare phenomena, but have occasionally been of catastrophic proportions. The two largest peace-time urban fires in history, 1906 San Francisco and 1923 Tokyo, were both caused by earthquakes.
>
> The fact that fire following earthquake has been little researched or considered in the United States is particularly surprising when one realizes that the conflagration in San Francisco after the 1906 earthquake was the single largest urban fire, and the single largest earthquake loss, in U.S. history. The loss over three days of more than 28,000 buildings within an area of 12 km2 was staggering: $250 million in 1906 dollars, or about $5 billion at today's prices.
>
> The 1989 Loma Prieta Earthquake, the 1991 Oakland hills fire, and Japan's recent Hokkaido Nansei-oki Earthquake all demonstrate the current, real possibility of a large fire, such as a fire following an earthquake, developing into a conflagration. In the United States, all the elements that would hamper fire-fighting capabilities are present: density of wooden structures, limited personnel and equipment to address multiple fires, debris blocking the access of fire-fighting equipment, and a limited water supply."[12]

In Southern California, the above referenced scenario highlights the need for fire mitigation activity in all sectors of the region, urban/wildland interface or not.

## FIRE CODES

### Local Fire Codes

Code of the City of Diamond Bar, CA. Title 16 Fire Safety, Cross references: Public Health , Ch. 5.112; Theaters, Ch. 5.132; emergency organization, Ch. 8.00; Smoking, Ch. 8.08; Parades, Ch. 10.32; and construction and safety codes; 15.00.010.

Chapter 16.00. Fire Code, Section 16.00.010 Adopted; 20 Amendments to Fire Code; 30 Violations; 40 Responsibility; 50 List of infractions.

Chapter 16.04. Fireworks, Section 16.04.010 Sale, Use or Discharge prohibited; 020, Penalty for violation of Chapter.

These sections of the Diamond Bar Municipal Code in conjunction with the applicable County Codes listed below are directed to wildland fire hazard mitigation.

**County Fire Codes**

The City of Diamond Bar has on file the most recently adopted 2002 County of Los Angeles Fire Code with its amendments.

County of Los Angeles 2002 Fire Code Title 32, Adopting by reference the 2001 edition of the California Fire Code and the 2000 edition of the Uniform Fire Code of the Western Fire Chiefs Association, Inc. and the Uniform Fire Code Association, County Ordinance No. 2002-0080, effective November 1, 2002. Key sections of the county code that apply to wildland/urban interface areas and supercede local ordinances in regard to wildland fire hazards mitigation are available from Los Angeles County Fire Department Battalion Chief Thomas Page, Station 120, 1051 S. Grand Ave., Diamond Bar, telephone number (909) 612-5869 or from Captain Ricky Lewis in the Codes and Ordinance Unit, County of Los Angeles Fire Department, 1320 North Eastern Ave., Los Angeles, (323) 890-4226.

Also see the Wild Fire Mitigation Action Items on Page 151.

**State Fire Codes**

The City of Diamond Bar has on file the State fire codes that apply locally which address wildland fire hazard mitigation. Said files are available upon request.

**Federal Programs**

The role of the federal land managing agencies in the wildland /urban interface is reducing fuel hazards on the lands they administer; cooperating in prevention and education programs; providing technical and financial assistance; and developing agreements, partnerships and relationships with property owners, local protection agencies, states and other stakeholders in wildland/urban interface areas. These relationships focus on activities before a fire occurs, which render structures and communities safer and better able to survive a fire occurrence.

Federal Emergency Management Agency (FEMA) Programs FEMA is directly responsible for providing fire suppression assistance grants and, in certain cases, major disaster assistance and hazard mitigation grants in response to fires. The role of FEMA in the wildland /urban interface is to encourage comprehensive disaster preparedness plans and programs, increase the capability of state and local governments and provide for a greater understanding of FEMA programs at the federal, state and local levels.[13]

**Fire Suppression Assistance Grants**

Fire Suppression Assistance Grants may be provided to a state with an approved hazard mitigation plan for the suppression of a forest or grassland fire that threatens to become a major disaster on public or private lands. These grants are provided to protect life and improved property and encourage the development and implementation of viable multi-hazard mitigation

measures and provide training to clarify FEMA's programs. The grant may include funds for equipment, supplies and personnel. A Fire Suppression Assistance Grant is the form of assistance most often provided by FEMA to a state for a fire. The grants are cost-shared with states. FEMA's US Fire Administration (USFA) provides public education materials addressing wildland/urban interface issues and the USFA's National Fire Academy provides training programs.

**Hazard Mitigation Grant Program**
Following a major disaster declaration, the FEMA Hazard Mitigation Grant Program provides funding for long-term hazard mitigation projects and activities to reduce the possibility of damages from all future fire hazards and to reduce the costs to the nation for responding to and recovering from the disaster.

**National Wildland/Urban Interface Fire Protection Program**
Federal agencies can use the National Wildland/Urban Interface Fire Protection Program to focus on wildland/urban interface fire protection issues and actions. The Western Governors' Association (WGA) can act as a catalyst to involve state agencies, as well as local and private stakeholders, with the objective of developing an implementation plan to achieve a uniform, integrated national approach to hazard and risk assessment and fire prevention and protection in the wildland/urban interface. The program helps states develop viable and comprehensive wildland fire mitigation plans and performance-based partnerships.

**U.S. Forest Service**
The U. S. Forest Service (USFS) is involved in a fuel-loading program implemented to assess fuels and reduce hazardous buildup on forest lands. The USFS is a cooperating agency and, while it has little to no jurisdiction in the lower valleys, it has an interest in preventing fires in the interface, as fires often burn up the hills and into the higher elevation US forest lands.

**Other Mitigation Programs and Activities**
Some areas of the country are facing wildland/urban issues collaboratively. These are model programs that include local solutions. Summit County, Colorado, has developed a hazard and risk assessment process that mitigates hazards through zoning requirements. In California, the Los Angeles County Fire Department has retrofitted more than 100 fire engines with fire retardant foam capability and Orange County is evaluating a pilot insurance grading and rating schedule specific to the wildland/urban interface. All are examples successful programs that demonstrate the value of pre-suppression and prevention efforts when combined with property owner support to mitigate hazards within the wildland/urban interface.

**Prescribed Burning**
The health and condition of a forest will determine the magnitude of wildfire. If fuels - slash, dry or dead vegetation, fallen limbs and branches - are allowed to accumulate over long periods of time without being methodically cleared, fire can move more quickly and destroy everything in its path. The results are more catastrophic than if the fuels are periodically eliminated. Prescribed burning is the most efficient method to get rid of these fuels. In California during 2003, various fire agencies conducted over 200 prescribed fires and burned over 33,000 acres to reduce the wildland fire hazard.

**Firewise**
Firewise is a program developed within the National Wildland/ Urban Interface Fire Protection Program and it is the primary federal program addressing interface fire. It is administered through the National Wildfire Coordinating Group whose extensive list of participants includes a wide range of federal agencies. The program is intended to empower planners and decision makers at the local level. Through conferences and information dissemination, Firewise increases support for interface wildfire mitigation by educating professionals and the general public about hazard evaluation and policy implementation techniques. Firewise offers online wildfire protection information and checklists, as well as listings of other publications, videos and conferences. The interactive home page allows users to ask fire protection experts questions and to register for new information as it becomes available.

**Fire Free Program**
Fire Free is a unique private/public program for interface wildfire mitigation involving partnerships between an insurance company and local government agencies. It is an example of an effective non-regulatory approach to hazard mitigation. Originating in Bend, Oregon, the program was developed in response to the city's "Skeleton Fire" of 1996, which burned over 17,000 acres and damaged or destroyed 30 homes and structures. Bend sought to create a new kind of public education initiative that emphasized local involvement. SAFECO Insurance Corporation was a willing collaborator in this effort. Bend's pilot program included:

1. A short video production featuring local citizens as actors, made available at local video stores, libraries and fire stations;
2. Two city-wide yard debris removal events;
3. A 3D-minute program on a model Fire Free home, aired on a local cable television station; and
4. Distribution of brochures, featuring a property owner evaluation checklist and a listing of fire-resistant indigenous plants.

**WILD FIRE MITIGATION ACTION ITEMS**

> As stated in the Federal Wildland Fire Policy, "The problem is not one of finding new solutions to an old problem but of implementing known solutions. Deferred decision making is as much a problem as the fires themselves. If history is to serve us in the resolution of the wildland/urban interface problem, we must take action on these issues now. To do anything less is to guarantee another review process in the aftermath of future catastrophic fires."[14]

The wildfire mitigation action items provide direction on specific activities that organizations and residents in Southern California can undertake to reduce risk and prevent loss from wildfire events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

> The **City of Diamond Bar 2001 Construction Code Amendments** call out the ongoing mitigation effort that relates to the elimination of combustible roof covering. Specifically: "Section 1503 – Amended: Section 1503 of the California Building Code as heretofore adopted is amended to read, in words and figures, as follows:

**Roof Covering Requirements.**
Section 1503. The roof covering or roofing assembly on any structure regulated by this code shall as specified in Table 15-A and as classified in Section 1504. Noncombustible roof covering as defined in Section 1504.2 may be applied in accordance with the manufacture's requirements in lieu of a fire-retardant roofing assembly. Roofing shall be secured or fastened to the supporting roof construction and shall provide weather protection for the building at the roof.

**Roof Covering Within Fire Zones.**
Unless governed by more stringent requirements of this law, roofs on all buildings within all areas designated as Fire Zone 4 by the Los Angeles County Fire Protection District, and approved by the City Council, shall have at least a Class A roof covering.

1. Section 1503 is applicable to new building and to existing building when twenty-five percent (25%) or more of the roof area is reroofed with a one-year period after issuance of a building permit.

2. Section 1503 is not applicable to existing buildings under operation of a license or which owners have made applicable for licensure issued by the California Department of Social Services of the California Department of Health Service.

   Exception: Existing building that have twenty-five percent (25%) or more roof area reroofed within a one-year period after the issuance of the building permit or after commencing construction, are required to be fire retardant by other provisions of this code.

3. The installer of the roof covering shall provide certification of the roof covering classification to the building owner and, when requested, to the inspection authority having jurisdiction.

   Section 1504 – Amended.

   Section 1504 of the California Building Code, hereby is amended by the addition of subparagraph 1504.4 to read, in words and figures, as follows:

   1504.4 Exception: Except as required with Section 1503 of the California Building Code, as adopted by the City Council of the City of Diamond Bar, and notwithstanding any other provision of this Code, and existing roof covering not inconformity with this Section may be repaired by use of similar non-conforming roof covering materials where the repair thereof does not exceed twenty-five percent (25%) of the existing gross roof area; provided, however, that the twenty-five percent (25%) exception provided hereunder may be utilized only once in any twelve (12) month period time."

**Mitigation Action 6.1: Reduced Wildfire Threat.** Continue existing programs requiring use of fire-resistant roof materials, brush clearance and landscaping, along with

periodic inspection by County Fire Department personnel, in existing development located in and around areas prone to wildfire, to avoid structural damage and/or injury.

**Lead Department**: City Manager's Office, Fire Department
**Implementation Schedule:** Ongoing
**Hazards Addressed:** Wildfire
**Priority:** One

**Goals and Objective Implemented:** Protection of Life and Property, Emergency Services:

Goal 1.3: Minimize losses to existing property and reduce potential for damage to future development (Objective 1.31).

Goal 3.1: Balance natural resource management and land use planning with natural hazard mitigation to protect life, property and environment (Objectives 3.1.1, 3.1.2).

---

1 http://www.fire.ca.gov/php/2003fireseasonstats_v2.asp

2 http://www.fire.ca.gov/php/fire_er_content/downloads/2003LargeFires.pdf

3 http://www.usgs.gov/public/press/public_affairs/press_releases/pr1805m.html

4 http://www.nifc.gov/stats/wildlandfirestats.html

5 http://research.yale.edu/gisf/assets/pdf/ppf/wildfire_report.pdf

6 Planning for Natural Hazards: The Oregon Technical Resource Guide, (July 2000) Department of Land Conservation and Development

7 http://www.usgs.gov/public/press/public_affairs/press_releases/pr1805m.html

8 Overgrown Forests Require Preventive Measures, By Gale A. Norton (Secretary of the Interior), USA Today Editorial, August 21, 2002

9 http://www.coastal.ca.gov/fire/ucsbfire.html

10 Ibid

11 Planning for Natural Hazards: The Oregon Technical Resource Guide, (July 2000), Department of Land Conservation and Development

12 http://www.eqe.com/publications/revf93/firefoll.htm

13 Source: National Interagency Fire Center, Boise ID and California Division of Forestry, Riverside Fire Lab.

14 http://www.fs.fed.us/land/wdfire7c.htm

## SECTION 10: WINDSTORM

### WHY ARE WINDSTORMS A THREAT TO DIAMOND BAR?


Figure 10-1 from NASA's "Observatorium"

Windstorms have not historically been a serious hazard in Diamond Bar and the potential risk of widespread damage from wind is not considered as high as the risk form earthquakes or wildfires.

However, severe wind storms pose a significant risk to life and property in the region by creating conditions that disrupt essential systems such as public utilities, telecommunications, and transportation routes. High winds can and do occasionally cause tornado-like damage to local homes and businesses. Severe windstorms can present a very destabilizing effect on the dry brush that covers local hillsides and urban wildland interface areas. High winds can have destructive impacts, especially to trees, power lines, and utility services.

### WINDSTORM CHARACTERISTICS IN SOUTHERN CALIFORNIA

**Santa Ana Winds and Tornado-Like Wind Activity**

Based on local history, most incidents of high wind in the City of Diamond Bar are the result of the Santa Ana wind conditions. While high impact wind incidents are not frequent in the area, significant Santa Ana Wind events and sporadic tornado activity have been known to negatively impact the local community.

**What are Santa Ana Winds?**

"Santa Ana winds are generally defined as warm, dry winds that blow from the east or northeast (offshore). These winds occur below the passes and canyons of the coastal ranges of Southern California and in the Los Angeles basin. Santa Ana winds often blow with exceptional speed in the Santa Ana Canyon (the canyon from which it derives its name). Forecasters at the National Weather Service offices in Oxnard and San Diego usually place speed minimums on these winds and reserve the use of "Santa Ana" for winds greater than 25 knots."[1] These winds accelerate to speeds of 35 knots as they move through canyons and passes, with gusts to 50 or even 60 knots.

"The complex topography of Southern California combined with various atmospheric conditions create numerous scenarios that may cause widespread or isolated Santa Ana events. Commonly, Santa Ana winds develop when a region of high pressure builds over the Great Basin (the high plateau east of the Sierra mountains and west of the Rocky mountains including most of Nevada and Utah). Clockwise circulation around the center of this high pressure area forces air downslope from the high plateau. The air warms as it descends toward the California coast at the rate of 5 degrees F per 1000 feet due to compressional heating. Thus, compressional heating

provides the primary source of warming. The air is dry since it originated in the desert, and it dries out even more as it is heated."[2]

These regional winds typically occur from October to March, and, according to most accounts are named either for the Santa Ana River Valley where they originate or for the Santa Ana Canyon, southeast of Los Angeles, where they pick up speed.

**What are Tornados?**

Tornadoes are spawned when there is warm, moist air near the ground, cool air aloft, and winds that speed up and change direction. An obstruction, such as a house, in the path of the wind causes it to change direction. This change increases pressure on parts of the house, and the combination of increased pressures and fluctuating wind speeds creates stresses that frequently cause structural failures.

In order to measure the intensity and wind strength of a tornado, Dr. T. Theodore Fujita developed the Fujita Tornado Damage Scale. This scale compares the estimated wind velocity with the corresponding amount of suspected damage. The scale measures six classifications of tornadoes with increasing magnitude from an "F0" tornado to a "F6+" tornado.

Table 10-1:Fujita Tornado Damage Scale

| Scale | Wind Estimate (mph) | Typical Damage |
|---|---|---|
| F0 | < 73 | Light damage. Some damage to chimneys and TV antennas; breaks twigs off trees; pushes over shallow-rooted trees. |
| F1 | 73-112 | Moderate damage. Peels surface off roofs; windows broken; light trailer houses pushed or overturned; some trees uprooted or snapped; moving automobiles pushed off the road. 74 mph is the beginning of hurricane wind speed. |
| F2 | 113-157 | Considerable damage. Roofs torn off frame houses leaving strong upright walls; weak buildings in rural areas demolished; trailer houses destroyed; large trees snapped or uprooted; railroad boxcars pushed over; light object missiles generated; cars blown off highway. |
| F3 | 158-206 | Severe damage. Roofs and some walls torn off frame houses; some rural buildings completely demolished; trains overturned; steel-framed hangar-warehouse-type structures torn; cars lifted off the ground; most trees in a forest uprooted snapped, or leveled. |
| F4 | 207-260 | Devastating damage. Whole frame houses leveled, leaving piles of debris; steel structures badly damaged; trees debarked by small flying debris; cars and trains thrown some distances or rolled considerable distances; large missiles generated. |
| F5 | 261-318 | Incredible damage. Whole frame houses tossed off foundations; steel-reinforced concrete structures badly damaged; automobile-sized missiles generated; trees debarked; incredible phenomena can occur. |
| F6-F12 | 319 to sonic | Inconceivable damage. Should a tornado with the maximum wind speed in excess of F5 occur, the extent and types of damage may not be conceived. A number of missiles such as iceboxes, water heaters, storage tanks, automobiles, etc. will create serious secondary damage on structures. |

Source: http://weather.latimes.com/tornadoFAQ.asp

**Microbursts**

Unlike tornados, microbursts, are strong, damaging winds which strike the ground and often give the impression a tornado has struck. They frequently occur during intense thunderstorms. The

origin of a microburst is downward moving air from a thunderstorm's core. But unlike a tornado, they affect only a rather small area.

University of Chicago storm researcher Dr Ted Fujita first coined the term “downburst” to describe strong, downdraft winds flowing out of a thunderstorm cell that he believed were responsible for the crash of Eastern Airlines Flight 66 in June of 1975.[3]

A downburst is a straight-direction surface wind in excess of 39 mph caused by a small-scale, strong downdraft from the base of convective thundershowers and thunderstorms. In later investigations into the phenomena he defined two sub-categories of downbursts: the larger macrobursts and small microbursts.[4]

Macrobursts are downbursts with winds up to 117 mph which spread across a path greater than 2.5 miles wide at the surface and which last from 5 to 30 minutes. The microburst, on the other hand is confined to an even smaller area, less than 2.5 miles in diameter from the initial point of downdraft impact. An intense microburst can result in damaging winds near 270 km/hr (170 mph) and often last for less than five minutes.[5]

> “Downbursts of all sizes descend from the upper regions of severe thunderstorms when the air accelerates downward through either exceptionally strong evaporative cooling or by very heavy rain which drags dry air down with it. When the rapidly descending air strikes the ground, it spreads outward in all directions, like a fast-running faucet stream hitting the sink bottom.
>
> When the microburst wind hits an object on the ground such as a house, garage or tree, it can flatten the buildings and strip limbs and branches from the tree. After striking the ground, the powerful outward running gust can wreak further havoc along its path. Damage associated with a microburst is often mistaken for the work of a tornado, particularly directly under the microburst. However, damage patterns away from the impact area are characteristic of straight-line winds rather than the twisted pattern of tornado damage.”[6]

Tornados, like those that occur every year in the Midwest and Southeast parts of the United States, are a rare phenomenon in most of California, with most tornado-like activity coming from micro-bursts.

**Local History of Windstorm Events**

While the effects of Santa Ana Winds are often overlooked, it should be noted that in 2003, two deaths in Southern California were directly related to the fierce condition. A falling tree struck one woman in San Diego.[7] The second death occurred when a passenger in a vehicle was hit by a flying pickup truck cover launched by the Santa Ana Winds.[8]

**Table 10-2: Santa Ana wind events were featured in news resources during 2003**

| | |
|---|---|
| January 6, 2003 OC Register | "One of the strongest Santa Ana windstorms in a decade toppled 26 power poles in Orange early today, blew over a mobile derrick in Placentia, crushing two vehicles, and delayed Metrolink rail service." This windstorm also knocked out power to thousands of people in northeastern Orange County. |
| January 8, 2003 CBSNEWS.com | "Santa Ana's roared into Southern California late Sunday, blowing over trees, trucks and power poles. Thousands of people lost power." |
| March 16, 2003 dailybulletin.com | Fire Officials Brace for Santa Ana Winds - - "The forest is now so dry and so many trees have died that fires, during relatively calm conditions, are running as fast and as far as they might during Santa Ana Winds. Now the Santa Ana season is here. Combine the literally tinder dry conditions with humidity in the single digits and 60-80 mph winds, and fire officials shudder." |

## *Table 10-3: Major Windstorms / Santa Ana Wind Events*

***Orange County Area from 1961- 2001***

| *Date* | *Location and Damage* |
|---|---|
| *November 5-6, 1961* | *Santa Ana winds. Fire in Topanga Canyon* |
| *February 10-11, 1973* | *Strong storm winds:. 57 mph at Riverside, 46 Newport Beach. Some 200 trees uprooted in Pacific Beach alone* |
| *October 26-27, 1993* | *Santa Ana winds. Fire in Laguna Hills* |
| *October 14, 1997* | *Santa Ana winds: gusts 87 mph in central Orange County. Large fire in Orange County* |
| *December 29, 1997* | *Gusts 60+ mph at Santa Ana* |
| *March 28-29, 1998* | *Strong storm winds in Orange County: sustained 30-40 mph. Gust 70 mph at Newport Beach, gust 60 Huntington Beach. Trees down, power out, and damage across Orange and San Diego Counties. 1 illegal immigrant dead in Jamul.* |
| *September 2, 1998* | *Strong winds from thunderstorms in Orange County with gusts to 40mph. Large fires in Orange County* |
| *December 6, 1998* | *Thunderstorm in Los Alamitos and Garden Grove: gust 50-60 mph called "almost a tornado"* |
| *December 21-22, 1999* | *Santa Ana winds: gust 68 mph at Campo, 53 Huntington Beach, 44 Orange. House and tree damage in Hemet.* |
| *March 5-6, 2000* | *Strong thunderstorm winds at the coast: gust 60 mph at Huntington Beach Property damage and trees downed along the coast* |
| *April 1, 2000* | *Santa Ana winds: gust 93 mph at Mission Viejo, 67 Anaheim Hills* |
| *December 25-26, 2000* | *Santa Ana winds: gust 87 mph at Fremont Canyon. Damage and injuries in Mira Loma, Orange and Riverside Counties* |
| *February 13, 2001* | *Thunderstorm gust to 89 mph in east Orange* |

Source:http://www.wrh.noaa.gov/sandiego/research/Guide/weatherhistory.pdf

Specifically, the City of Diamond Bar experienced a Microburst Windstorm event on the evening of January 6, and the morning of January 7, 1997. The city lost approximately 14 mature street trees on Flintgate, Calpet, Minnequa, Moonlake, Autumn Glow, Sunset Crossing, Palomino, Pintado, Navajo Spring and Rapid Brook. City staff and contractors responded to approximately 15 fallen branches in the Public Right-of-Way. In addition, there was tree related wind storm damage to at least seven Private Properties in the same general vicinity. The city received several Damage Claims related to city maintained trees and worked with its Claims Adjustor and the Southern California Joint Powers Insurance Authority to resolve them. See Map 22 Historical Microburst Windstorm Event Map.

The following is a glimpse of major tornado-like events to hit near City of Diamond Bar, and surrounding areas:

*Table 10 -4: Major Tornado-like Events in the Orange County Area 1958-2001*

| ***Date*** | ***Location and Damage*** |
|---|---|
| *April 1, 1958* | *Tornado: Laguna Beach* |
| *February 19, 1962* | *Tornado: Irvine* |
| *April 8, 1965* | *Tornado: Costa Mesa* |
| *November 7, 1966* | *Newport Beach and Costa Mesa: Property Damage* |
| *March 16, 1977* | *Tornado skipped from Fullerton to Brea Damage to 80 homes and injured four people* |
| *February 9, 1978* | *Tornado: Irvine. Property damage and 6 injured* |
| *January 31, 1979* | *Tornado Santa Ana Numerous power outages* |
| *November 9, 1982* | *Tornadoes in Garden Grove and Mission Viejo. Property damage* |
| *January 13, 1984* | *Tornado: Huntington Beach. Property damage* |
| *March 16, 1986* | *Tornado: Anaheim. Property damage* |
| *February 22-24, 1987* | *Tornadoes and waterspouts: Huntington Beach* |
| *January 18, 1988* | *Tornadoes: Mission Viejo and San Clemente. Property damage* |
| *February 28, 1991* | *Tornado: Tustin* |
| *March 27, 1991* | *Tornado: Huntington Beach* |
| *December 7, 1992* | *Tornadoes: Anaheim and Westminster Property damage* |
| *January 18, 1993* | *Tornado: Orange County Property damage* |
| *February 8, 1993* | *Tornado: Brea. Property damage* |
| *February 7, 1994* | *Tornado from Newport Beach to Tustin. Roof and window damage. Trees were also knocked down* |
| *December 13, 1994* | *Two waterspouts about 0.5 mile off Newport Beach* |
| *December 13, 1995* | *Funnel cloud near Fullerton Airport* |
| *March 13, 1996* | *Funnel cloud in Irvine* |

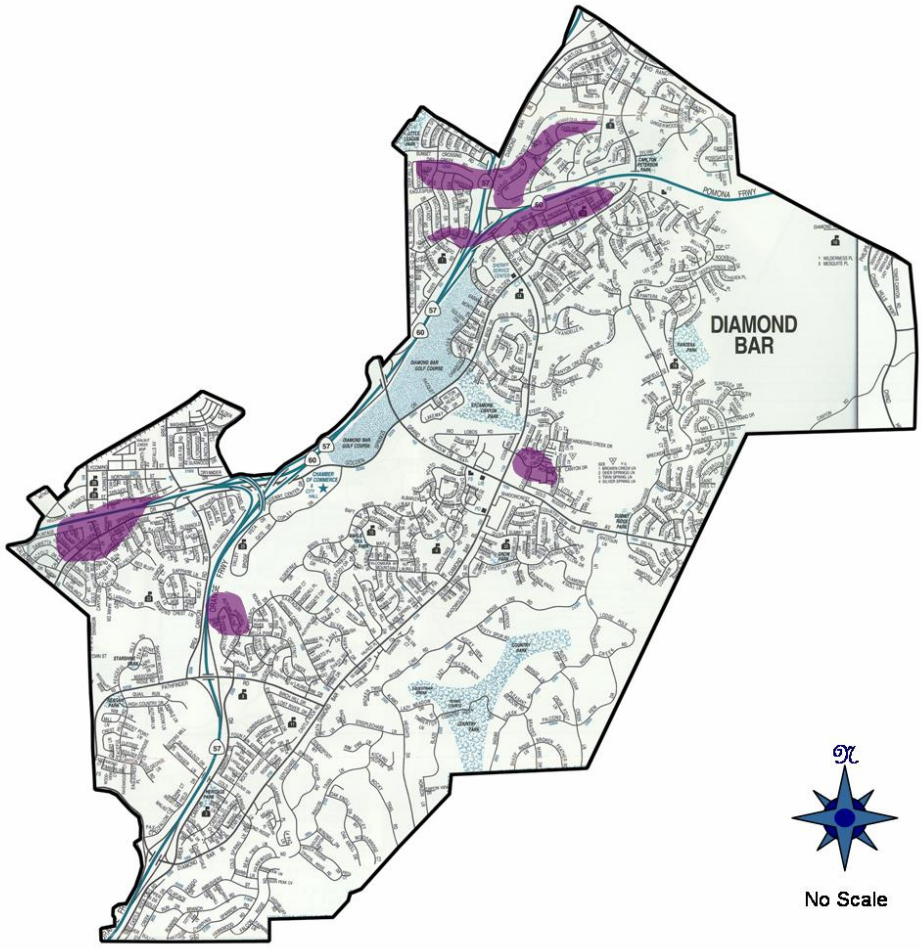
| | |
|---|---|
| *November 10-11, 1997* | *Waterspout came ashore at Newport Pier on the 10th and dissipated over western Costa Mesa. Tornadoes in Irvine on the 11th and a funnel cloud developed. 10th: Winds estimated at 60-70 mph. 11th: Minor power outages occurred with little property damage. A fisherman was blown from one end of Newport Pier to the other. Property and vehicle damage in Irvine from flying debris. Ten cars were thrown a few feet.* |
| *December 21, 1997* | *Waterspout and tornado in Huntington Beach. Damage to boats, houses, and city property* |
| *February 24, 1998* | *Tornado in Huntington Beach. Property damage with a power outage, roof flew ¼ mile* |
| *March 13-14, 1998* | *Numerous waterspouts between Long Beach, Huntington Beach, and Catalina* |
| *March 31-April 1, 1998* | *Numerous funnel clouds reported off Orange County coastline, two of which became waterspouts off Orange County. One waterspout briefly hit the coast off the Huntington Beach pier.* |
| *June 6, 1998* | *Two funnel clouds off Dana Point* |
| *December 31, 1998* | *Funnel clouds in Santa Ana. Waterspout off Costa Mesa coast* |
| *February 21, 2000* | *Tornado: Anaheim Hills. Property damage* |
| *October 28, 2000* | *Funnel clouds around Newport Beach and Costa Mesa* |
| *January 10, 2001* | *Funnel cloud at Orange County airport and Newport Beach* |
| *February 24, 2001* | *Tornado in Orange. Damage to warehouse, 6 structures, fences, and telephone wires.* |
| Source: http://www.wrh.noaa.gov/sandiego/research/Guide/weatherhistory.pdf | |

**Windstorm Hazard Assessment**

Hazard Identification
A windstorm event in the region can range from short term microburst activity lasting only minutes to a long duration Santa Ana wind condition that can last for several days as in the case of the January 2003 Santa Ana wind event. Windstorms in the City of Diamond Bar area can cause extensive damage including heavy tree stands, exposed coastal properties, road and highway infrastructure, and critical utility facilities.

Figure 10- 2 from NASA's "Observatorium"

The map shows clearly the direction of the Santa Ana winds as they travel from the stable, high-pressure weather system called the Great Basin High




**Map 22**

## Historical Microburst Windstorm Event Map

LEGEND

- Historical Microburst Windstorm Event
- Golf Course and Park Areas

through the canyons and towards the low-pressure system off the Pacific. Clearly the area of the City of Diamond Bar is in the direct path of the ocean-bound Santa Ana winds.

With an analysis of the high wind and tornado events depicted in the "Local History" section, we can deduce the common windstorm impact areas including impacts on life, property, utilities, infrastructure and transportation. Additionally, if a windstorm disrupts power to local residential communities, the American Red Cross and City resources might be called upon for care and shelter duties. Displacing residents and utilizing City resources for shelter staffing and disaster cleanup can cause an economic hardship on the community.

## COMMUNITY WINDSTORM ISSUES

### What is Susceptible to Windstorms?

#### Life and Property

Based on the history of the region, windstorm events can be expected, perhaps annually, across widespread areas of the region which can be adversely impacted during a windstorm event. This can result in the involvement of City of Diamond Bar emergency response personnel during a wide-ranging windstorm or microburst tornadic activity. Both residential and commercial structures with weak reinforcement are susceptible to damage. Wind pressure can create a direct and frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift suction forces that pull building components and surfaces outward. With extreme wind forces, the roof or entire building can fail causing considerable damage.

Debris carried along by extreme winds can directly contribute to loss of life and indirectly to the failure of protective building envelopes, siding, or walls. When severe windstorms strike a community, downed trees, power lines, and damaged property can be major hindrances to emergency response and disaster recovery.

#### Utilities

Historically, falling trees have been the major cause of power outages in the region. Windstorms such as strong microbursts and Santa Ana Wind conditions can cause flying debris and downed utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events. Falling trees can bring electric power lines down to the pavement, creating the possibility of lethal electric shock. Rising population growth and new infrastructure in the region creates a higher probability for damage to occur from windstorms as more life and property are exposed to risk.

#### Infrastructure

Windstorms can damage buildings, power lines, and other property and infrastructure due to falling trees and branches. During wet winters, saturated soils cause trees to become less stable and more vulnerable to uprooting from high winds.

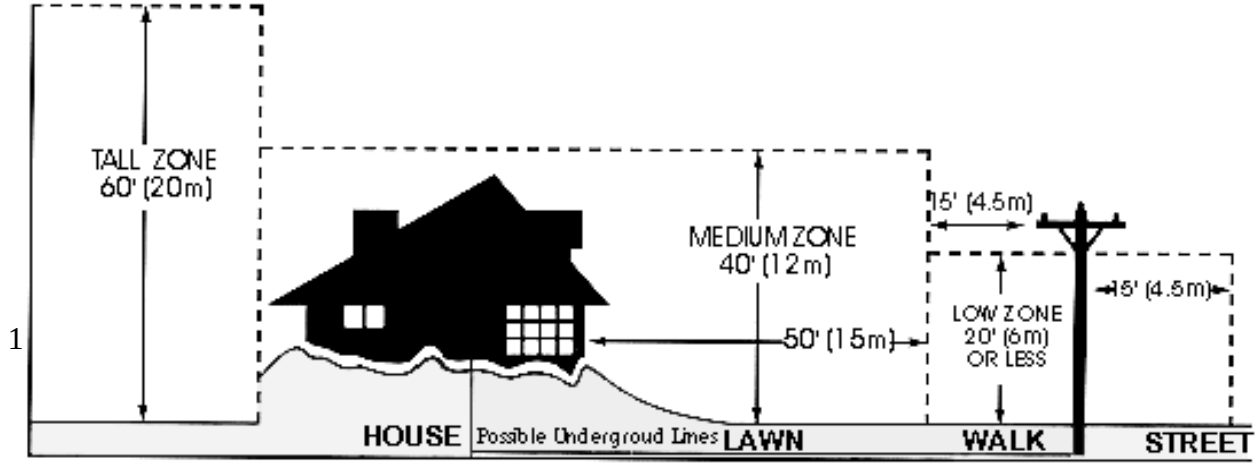
The Beaufort Scale below, coined and developed by Sir Francis Beaufort in 1805, illustrates the effect that varying wind speed can have on sea swells and structures:

Table 10-5: Beaufort Scale

| Beaufort Force | Speed (mph) | Wind Description - State of Sea - Effects on Land |
|---|---|---|
| 0 | Less 1 | Calm - Mirror-like - Smoke rises vertically |
| 1 | 1-3 | Light - Air Ripples look like scales; No crests of foam - Smoke drift shows direction of wind, but wind vanes do not |
| 2 | 4-7 | Light Breeze - Small but pronounced wavelets; Crests do not break - Wind vanes move; Leaves rustle; You can feel wind on the face |
| 3 | 8-12 | Gentle Breeze - Large Wavelets; Crests break; Glassy foam; A few whitecaps - Leaves and small twigs move constantly; Small, light flags are extended |
| 4 | 13-18 | Moderate Breeze - Longer waves; Whitecaps - Wind lifts dust and loose paper; Small branches move |
| 5 | 19-24 | Fresh Breeze - Moderate, long waves; Many whitecaps; Some spray - Small trees with leaves begin to move |
| 6 | 25-31 | Strong Breeze - Some large waves; Crests of white foam; Spray - Large branches move; Telegraph wires whistle; Hard to hold umbrellas |
| 7 | 32-38 | Near Gale - White foam from breaking waves blows in streaks with the wind - Whole trees move; Resistance felt walking into wind |
| 8 | 39-46 | Gale - Waves high and moderately long; Crests break into spin drift, blowing foam in well marked streaks - Twigs and small branches break off trees; Difficult to walk |
| 9 | 47-54 | Strong Gale - High waves with wave crests that tumble; Dense streaks of foam in wind; Poor visibility from spray - Slight structural damage |
| 10 | 55-63 | Storm - Very high waves with long, curling crests; Sea surface appears white from blowing foam; Heavy tumbling of sea; Poor visibility - Trees broken or uprooted; Considerable structural damage |
| 11 | 64-73 | Violent Storm - Waves high enough to hide small and medium sized ships; Sea covered with patches of white foam; Edges of wave crests blown into froth; Poor visibility - Seldom experienced inland; Considerable structural damage |
| 12 | >74 | Hurricane - Sea white with spray. Foam and spray render visibility almost non-existent - Widespread damage. Very rarely experienced on land. |

Source: http://www.compuweather.com/decoder-charts.html

Windstorms can result in collapsed or damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Roads blocked by fallen trees during a windstorm may have severe consequences to people who need access to emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and commerce can suffer losses from interruptions in electric services and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from windstorms related to both physical damages and interrupted services.




**Increased Fire Threat**

Perhaps the greatest danger from windstorm activity in Southern California comes from the combination of the Santa Ana winds with the major fires that occur every few years in the urban/wildland interface. With the Santa Ana winds driving the flames, the speed and reach of the flames is even greater than in times of calm wind conditions. The higher fire hazard raised by a Santa Ana wind condition requires that even more care and attention be paid to proper brush clearances on property in the wildland/urban interface areas.

**Transportation**

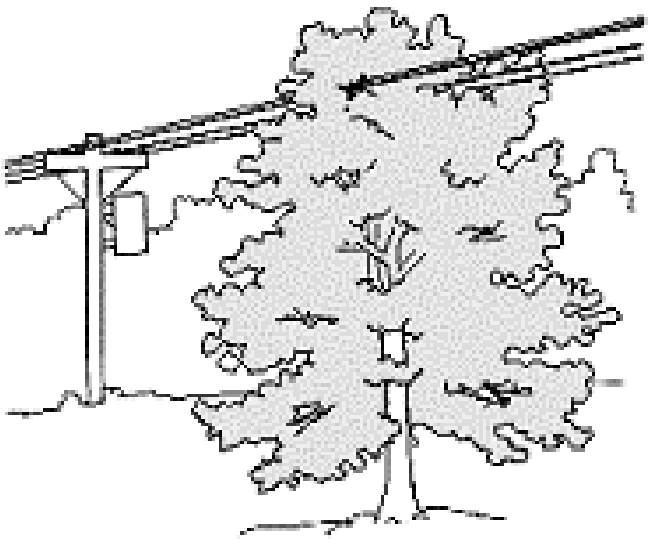
Windstorm activity can have an impact on local transportation in addition to the problems caused by downed trees and electrical wires blocking streets and highways. During periods of extremely strong Santa Ana winds, major highways can be temporarily closed to truck and recreational vehicle traffic. However, typically these disruptions are not long lasting, nor do they carry a severe long term economic impact on the region.

**Existing Windstorm Mitigation Activities**

As stated, one of the most common problems associated with windstorms is power outage. High winds commonly occur during winter storms, and can cause trees to bend, sag, or fail (tree limbs or entire trees), coming into contact with nearby distribution power lines. Fallen trees can cause short-circuiting and conductor overloading. Wind-induced damage to the power system causes power outages to customers, incurs cost to make repairs, and in some cases can lead to ignitions that start wild land fires.

One of the strongest and most widespread existing mitigation strategies pertains to tree clearance. Currently, California State Law requires utility companies to maintain specific

clearances (depending on the type of voltage running through the line) between electric power lines and all vegetation.



Enforcement of the following California Public Resource Code Sections provides guidance on tree pruning regulations:[9]

4293: Power Line Clearance Required
4292: Power Line Hazard Reduction
4291: Reduction of Fire Hazards Around Buildings
4171: Public Nuisances

The following pertain to tree pruning regulations and are taken from the California Code of Regulations:

Title 14: Minimum Clearance Provisions
Sections 1250-1258
General Industry Safety Orders
Title 8: Group 3: Articles 12, 13, 36, 37, 38
California Penal Code Section 385

Finally, the following California Public Utilities Commission section has additional guidance:

California Public Utilities Commission
General Order 95: Rule 35

Homeowner Liability:
Failure to allow a utility company to comply with the law can result in liability to the homeowner for damages or injuries resulting from a vegetation hazard.
Many insurance companies do not cover these types of damages if the policy owner has refused to allow the hazard to be eliminated.

The power companies, in compliance with the above regulations, collect data about tree failures and their impact on power lines. This mitigation strategy assists the power company in preventing future tree failure. From the collection of this data, the power company can advise residents as to the most appropriate vegetative planting and pruning procedures. The following chart depicts some of the tree failure data collected by Southern California Edison in this comprehensive mitigation strategy:

**Windstorm Mitigation Action Items**
The windstorm mitigation action items provide direction on specific activities that organizations and residents in City of Diamond Bar can undertake to reduce risk and prevent loss from windstorm events. Each action item is followed by ideas for implementation, which can be used by the Natural Hazards Mitigation Planning Committee and local decision makers in pursuing strategies for implementation.

## CITY OF DIAMOND BAR MITIGATION STRATEGY RECOMMENDATIONS

**Mitigation Action 2.1: Maintain Integrity of Emergency Operations Center System.** Maintain the system of the Emergency Operations Center (City Hall) with alternative back-up facilities (Diamond Bar Center, Community Center at Heritage Park) to be activated in the event the central facility is impaired. Because city government operations may be effected if back-up locations must be activated, develop the portable EOC-in-a-box Program and train staff in its use.

**Goals and Objective Implemented:** 1. Protect Life and Property, 4. Partnerships and Implementation, 5. Emergency Services

**Hazards Addressed:** All
**Lead Department:** Public Safety
**Priority:** One

**Mitigation Action 3.1: Communication/Early Warning Systems and Local Consideration.** Review the disaster preparation, response and early warning programs of neighboring jurisdictions, agencies and utilities servicing the community. Also contact private companies (including railroads) to ensure that the needs of Diamond Bar are addressed in planning and infrastructure improvement initiatives. Advocate making the City a primary recipient of early hazard warning and renew or establish communication protocols.

**Goals and Objective Implemented:** 1. Protect Life and Property, 4. Partnerships and Implementation

**Hazards Addressed:** All
**Lead Department:** City Manager's Office
**Priority:** Two

**Mitigation Action 5.1: Annual Emergency Preparedness Campaign.** Each year, implement a customized public education campaign for residents and businesses about appropriate emergency preparedness measures and what to do in the event of a disaster. Develop a special annual theme and topic to increase awareness and to try and grab the public attention.

- Incorporation of special publications and inserts in the City's newsletter and other mailings such as utility bills;
- Develop a traveling Public Education booth to set up at city events, in shopping center, community centers/public counters, schools and other activity centers;
- Post information on city's website;
- Press releases;
- Study sessions with City Council and commissioners;
- Presentations to community organizations and service clubs and dissemination of literature through organizations' membership networks---Diamond Bar's strong

community networks are one of the best mechanisms for reaching residents and small business owners;
- Coordination with Walnut Valley and Pomona Unified School Districts to distribute information to families with children and to conduct preparedness activities;
- Target high risk and vulnerable populations for special emphasis; and
- Include educations and training for City of Diamond Bar employees.

When developing and designing the disaster preparedness and public education campaign, special attention shall be paid to language, demographic and cultural characteristics of the Diamond Bar population to maximize its effectiveness. Information should be periodically distributed about non-structural improvements to mitigate hazard risks, such as securing bookcases, filing cabinets, light fixtures and similar objects that can cause injuries and block exits.

**Goals and Objective Implemented:** 1. Protect Life and Property, 2. Public Awareness, 4. Partnerships and Implementation, 5. Emergency Services

**Hazards Addressed:** All
**Lead Department:** Public Information, Public Safety
**Priority:** One

**Mitigation Action 6.9: Windstorm Preparedness**. Maintain local City and utility awareness of tree pruning and Fire Code Sections relevant to wind-resistant utility operations.
Provide information to City Planning Departments and local utility companies encouraging compliance with State and Local tree clearance and integrity guidelines by:
- Compile comprehensive list of pertinent State and local regulations
- Send letters of encouragement from the Natural Hazards Mitigation Planning Committee and local City and School officials encouraging utility compliance with guidelines

**Goals and Objective Implemented:** 1. Protect Life and Property, 2. Public Awareness, 4. Partnerships and Implementation, 5. Emergency Services
**Hazards Addressed:** Windstorm
**Lead Department:** Community Services, Planning Dept, Public Works, Emergency Services Offices
**Priority:** One

---

1 http://nimbo.wrh.noaa.gov/Sandiego/snawind.html

2 Ibid

3 Keith C. Heidorn at http://www.suite101.com/article.cfm/13646/100918, June 1, 2003

4 Ibid

5 Ibid

6 Ibid

7 www.cbsnews.com, January 8, 2003

8 www.cbsnews.com/stories/2003/01/06/national/

9 www.cpuc.ca.gov/js.asp

# Part III:

# Resource Appendices

# Appendix A

| STAPLEE Criteria | | S | | T | | | A | | | P | | | L | | | E | | | | E | | | | | PT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (Social) | | (Technical) | | | (Administrative) | | | (Political) | | | (Legal) | | | (Economic) | | | | (Environmental) | | | | | |
| **Considerations for Alternative Actions** | Estimated Cost to Accomplish Action | Community Acceptance | Effect on Segment of Population | Technical Feasibility | Long-term Solution | Secondary Impacts | Staffing | Funding Allocated | Maintenance/ Operations | Political Support | Local Champion | Public Support | State Authority | Existing Local Authority | Potential Legal Challenge | Benefit of Action | Cost of Action | Contributes to Economic Goals | Outside Funding Required | Effect on Land/ Water | Effect on Endangered Species | Effect on HAZMAT/Waste Sites | Consistent with Community Environmental Goals | Consistent with Federal Laws | Priority Total |
| Action 1.1 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 23 |
| Action 4.1 | $ 90,000.00 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 23 |
| Action 6.1 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 25 |
| Action 6.3 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 25 |
| Action 6.5 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 25 |
| Action 6.7 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 25 |
| Action 6.9 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 25 |
| Action 6.10 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 25 |
| Action 1.2 | Unknown | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 27 |
| Action 6.4 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 27 |
| Action 8.1 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 27 |
| Action 8.2 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 27 |
| Action 5.1 | $ 5,000.00 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 28 |
| Action 6.2 | $ - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 28 |
| Action 6.8 | Unknown | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 28 |
| Action 2.1 | $ 30,000.00 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 29 |
| Action 7.1 | Unknown | 1 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 31 |
| Action 5.2 | $ 2,000.00 | 2 | 3 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 32 |
| Action 3.1 | $ - | 1 | 1 | 1 | 4 | 1 | 2 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 3 | 1 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 35 |
| Action 8.3 | $ - | 1 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 36 |
| Action 8.4 | $ - | 1 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 1 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 36 |
| Action 6.6 | Unknown | 1 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 5 | 3 | 1 | 1 | 1 | 1 | 1 | 37 |
| Total = | $127,000 | | | | | | | | | | | | | | | | | | | | | | | | |

| Implementation Strategy | | | | |
|---|---|---|---|---|
| **Action I.D.** | **Lead Agency** | **Funding Source(s)** | **Completion Date** | **Critical Interim or Pilot Activities** |
| Action Item 1.1 | City Manager's Office | | Ongoing | - Implement NHMP and update as scheduled<br>- Establish & Maintain Committee Roster |
| Action Item 1.2 | City Manager's Office | | Ongoing | - Allocate and use City resources for HM projects effectively<br>- ID grant programs, partner with other agencies to pursue funding opportunities |
| Action Item 2.1 | City Mgr./Public Safety | Grant Funds | Short Term | - Develop and maintain EOC and build backup/portable alternatives |
| Action Item 3.1 | City Manager's Office | | Ongoing | - Review preparation and response programs of other agencies and companies<br>- Advocate making DB a primary recipient of early warning |
| Action Item 4.1 | Public Works/Comm. Serv./Info Sys. | Fiscal year 2005-2006 Budget | Complete | - Maintain GIS program and expand possible uses<br>- Train staff on GIS operation |
| Action Item 5.1 | City Mgr./Public Safety/Pub. Info. | Fiscal year 2005-2006 Budget | Ongoing | - Use City News, website, other City media to educate public on emergency preparedness |
| Action Item 5.2 | City Mgr./Pub Safety/Sheriff/Fire | Fiscal year 2005-2006 Budget | Short Term | - Open communication with DBARS and Neighborhood Watch to train local residents assist in emergency response |
| Action Item 6.1 | City Mgr./Fire Dept. | | Ongoing | - Continue existing practices mitigating wildfire treat, including development standards, brush clearance, and Fire Dept. inspection. |
| Action Item 6.2 | Public Works/LA Co. Public Works | | Ongoing | - Prioritize maintenance and repair of water and sewer lines in and around landslide prone areas. |

| | | | | |
|---|---|---|---|---|
| Action item 6.3 | Public Works/Building & Safety | | Ongoing | - Continue requiring geotechnical engineering inspection of landslide prone properties<br>- Provide educational and informational materials to residents and contractors building in prone areas. |
| Action Item 6.4 | Public Works/LA Co. Flood Control | | Ongoing | - Continue preventive maintenance on bench drains in residential and commercial areas |
| Action Item 6.5 | Hazard Mitigation Committee | | Ongoing | - Provide info to public regarding prevention of home damage during earthquakes<br>- Educate public on earthquake rerofitting through books/pamphlets/informational materials |
| Action Item 6.6 | Community Development | | Ongoing | - Update earthquake hazard map with new info as it is available<br>- Provide info to public when building/developing on historical earthquake sites. |
| Action Item 6.7 | Community Development | | Ongoing | - Continue to enforce development standards, including geotechnical review and CA Building Code<br>- Continue to encourage coordination between City Planning, Building & Safety, Engineering Depts. |
| Action Item 6.8 | Community Development | | Ongoing | - Begin review of earthquake building codes for development in prone areas<br>- Incorporate any new criteria related to earthquakes |
| Action Item 6.9 | Public Works/Comm. Serv./Planning | | Ongoing | - Review and incorporate state and local tree regulations.guidelines<br>- Encourage residents, business owners, schools to comply through letters/informational flyers |
| Action Item 6.10 | Public Works/Building & Safety | | Ongoing | - Maintain Restricted Use Area Zones related to development standards |

| | | | | |
|---|---|---|---|---|
| Action Item 7.1 | City Mgr./Public Safety | | Short Term | - Inventory and map vulnerable facilities in Emergency Preparedness Plan<br>- Request reps. From these facilities participate in disaster drills or CERT training |
| Action Item 8.1 | City Mgr./Public Safety | | Short Term | - Continue implementation of Emergency Preparedness Plan<br>- Update as needed with SEMS guidelines |
| Action Item 8.2 | City Mgr./Public Safety | | Short Term | - Continue implementation and update of SEMS plan |
| Action Item 8.3 | City Mgr./Public Safety | | Short Term | - Develop disaster drills and exit strategies for each City facility<br>- Conduct regular drills to educate employees |
| Action Item 8.4 | City Mgr./Public Safety | | Short Term | - Update life safety preparedness plan, conduct employee training and hold emergency evacuation drills in conjunction with AQMD at City Hall and at all other City facilities on an annual basis. |

# Natural Hazards Mitigation Plan (NHMP) Five – Year Action Plan Matrix – PRIORITY ONE ITEMS

| Mitigation Action Plan: Action Items | Mitigation Action | Hazards Addressed | Goals and Objectives Implemented | Lead/Responsible Department | Implementation Schedule 2004 - 2009 |
|---|---|---|---|---|---|
| NHMP Implementation Structure | Coordinator and Action Committee: Plan Implementation oversight, Preparing NHMP Annual Report, Updating NHMP every five years, Oversee Action Committee, Attend Area "D" meetings. | All – Earthquake, Landslide, Flood, Wildfire and Windstorm | Goal 1: All- Protect Life and Property, Goal 2: Public Awareness, Goal 3: Natural Systems, Goal 4: Partnerships and Implementation, Goal 5: Emergency Services. | City Manager's Office | Annually and On-going throughout five year period |
| NHMP Implementation Options for Hazard Mitigation | Allocate resources, Pursue Grants, Partner with other agencies to secure Grants and funding for mitigation efforts | All | All | City Manager's Office and City Departments | On-going |
| Critical Facilities and Emergency Operations Center (EOC) | Maintain Integrity of Emergency Operation Center at City Hall and develop alternative back-up facilities | All | Goal 1: Reduce the potential for life loss, injury and economic damage to Diamond Bar (DB) residents and businesses by maximizing emergency preparedness capabilities. Goal 5: Ensure continued operations when the City is impacted by natural hazard events. | City Manager's Office/ Public Safety | Short-term and long-term |
| Secure Geographic Information System (GIS) Access | Develop GIS Program capability for improved mapping and planning. | All | Goals 1 and 4. | Public Works, Community Services, Information Services | Short-term |

| Mitigation Action Plan: Action Items | Mitigation Action | Hazards Addressed | Goals and Objectives Implemented | Lead/Responsible Department | Implementation Schedule 2004 - 2009 |
|---|---|---|---|---|---|
| Community Preparedness and Education | Continue public education campaign for residents and businesses, including newsletter, website, press releases, etc. | All | Goals 2 and 4. | City Manager's Office. Public Information, Public Safety | On-going/Continuous |
| Resilient Housing, Neighborhoods and Commercial Districts | Reduce Wildfire Threat. Continue existing programs re: fire-resistant roof materials, brush clearance, weed abatement and landscaping programs. | Wildfire | Goals 1, 2 and 3. | City Manager's Office, Fire Department | On-going/Continuous |
| | Landslide Prevention. Continue maintenance and repair of water and sewer lines in landslide prone areas. | Landslide | Goals 1, 2 and 3. | Public Works, Los Angeles County Dept. of Public Works, Walnut Valley Water Dist. | On-going/Continuous |
| | Landslide Prevention – Code Compliance/Interdepartmental Communication/Public and Contractor Education. | Landslide | Goals 1, 2, 3 and 4. | Public Works, Building and Safety | On-going/Continuous |
| | Flood Prevention. Continue maintenance of down and bench drains to avoid build-up of debris | Floods | Goals 1, 2 and 3. | Public Works, LA County Flood Control Dist. | On-going/Continuous |
| | Earthquake Preparedness. Encourage continuous reduction of structural and nonstructural earthquake hazards in homes, schools, businesses and govt. offices. | Earthquake | Goals 1, 2 and 3. | Public Works, Building and Safety | On-going/Continuous |

| Mitigation Action Plan: Action Items | Mitigation Action | Hazards Addressed | Goals and Objectives Implemented | Lead/Responsible Department | Implementation Schedule 2004 - 2009 |
|---|---|---|---|---|---|
| | Earthquake Construction Design. Continue to encourage construction and subdivision design for step slopes. | Earthquake | Goals 1, 2, and 3. | Community Services and Development | On-going/Continuous |
| | Earthquake Building Codes. Continue to review and revise building codes for developments in earthquake prone areas. | Earthquake | Goals 1, 2 and 3. | Community Services and Development | On-going/Continuous |
| | Windstorm Preparedness. Continue to maintain local and utility awareness of tree pruning and Fire Code sections relevant to wind-resistant utility operations. | Windstorm | Goals 1, 2 and 3. | Community Services and Development, Public Works, Fire Dept., Public Safety, Utilities | On-going/Continuous |
| | Restricted Use Areas. Continue to maintain City's Restricted Use Area zones related to development standards for hillside properties to include best management practices for hazard and landslide prevention. | All | Goal 1. | Public Works, Building Safety | On-going/Continuous |
| Risk Reduction for Community Vulnerabilities | Accelerated Emergency Response for Vulnerable Populations. | All | Goal 1, 2, 4 and 5. | City Manager's Office, Public Safety, Fire Dept. | On-going/Continuous |

| Mitigation Action Plan: Action Items | Mitigation Action | Hazards Addressed | Goals and Objectives Implemented | Lead/Responsible Department | Implementation Schedule 2004 - 2009 |
|---|---|---|---|---|---|
| Emergency Preparedness Planning and Training | Diamond Bar Emergency Preparedness Plan. Continue to implement and update the DB Emergency Prep. Plan with State Standardized Emergency Management System (SEMS) Multi-hazard Functional Plan. | All | Goal 1. | City Manager's Office, Public Safety, Fire Dept. | On-going/Continuous |
| | City SEMS Planning and Training. Continue to implement SEMS Plan for DB. | All | Goal 1, 2, 4 and 5. | City Manager's Office, Public Safety, Fire Dept. | On-going/Continuous |
| | Emergency Preparedness Drills | All | Goal 1, 2, 4 and 5. | City Manager's Office, Public Safety, Fire Dept. | On-going/Continuous |

## Hazards Mitigation Plan (NHMP) Five – Year Action Plan Matrix – PRIORITY TWO ITEMS

| Mitigation Action Plan: Action Items | Mitigation Action | Hazards Addressed | Goals and Objectives Implemented | Lead/Responsible Department | Implementation Schedule 2004 - 2009 |
|---|---|---|---|---|---|
| Improve Communication and Coordination with Utilities and other Critical Facility Providers | Communication/Early Warning Systems and Local Consideration. Communicate with other agencies, utilities and private companies to ensure DB is primary recipient of early hazard warnings | All | Goals 1 and 4. | City Manager's Office | Ongoing |
| Community Preparedness and Education | All | Goals 1, 2, 4 and 5. | City Manager's Office, Public Safety, Fire Department | On-going/Continuous | Community Emergency Volunteers. Enhance involvement and partnership with CERT, DBARS and Neighborhood Watch groups. |
| Resilient Housing, Neighborhoods and Commercial Districts | Earthquake Understanding. Continue to improve and enhance earthquake hazards knowledge and disseminate information to residents, schools and | Earthquake | Goals 1, 2 and 3. | Community Services and Development | On-going/Continuous |

| | | | | | |
|---|---|---|---|---|---|
| | businesses. | | | | |
| Emergency Preparedness Planning and Training | City Hall Life Safety Planning and Evacuation Exercises | All | Goal 1, 2, 4 and 5. | City Manager's Office, Public Safety, Fire Dept. | On-going/Continuous |
| | City Hall Life Safety Planning and Evacuation Exercises | All | Goal 1, 2, 4 and 5. | City Manager's Office, Public Safety, Fire Dept. | On-going/Continuous |

**Appendix B**

# Total Hazard Risk Rating Form for City of Diamond Bar

| Level of Risk | Ground Shaking | Landslides | Liquefaction | Wildfire | Flooding | Windstorm |
|---|---|---|---|---|---|---|
| Magnitude | 3 | 2 | 2 | 2 | 1 | 1 |
| Duration | 3 | 2 | 2 | 2 | 1 | 1 |
| Distribution | 3 | 1 | 1 | 2 | 1 | 1 |
| Area Affected | 2 | 2 | 2 | 2 | 1 | 1 |
| Frequency | 1 | 1 | 1 | 2 | 1 | 1 |
| Probability | 2 | 2 | 2 | 3 | 1 | 2 |
| Degree of Vulnerability | 2 | 2 | 1 | 2 | 1 | 1 |
| Community Priority | 3 | 2 | 1 | 3 | 1 | 1 |
| Total Risk Score | 19 | 14 | 12 | 18 | 8 | 9 |

## Hazard Risk Categories

0 = No hazard risk in accordance with definitions for hazard prioritization on the following pages.

1 = Low Risk in accordance with the hazard prioritization definitions on the following pages.

2 = Moderate Risk in accordance with the hazard definitions on the following pages.

3 = High Risk in accordance with the hazard risk definitions on the following pages.

Total the numbers horizontally for each category. The highest possible score for a hazard is 24; the lowest potential score is 0.

After the completion of the matrix, the committee will assign the numerical values for the four categories of risk; 1 – highest priority risks, 2-moderate priority risks, 3-low priority risks and 0 –no risk rating values for prioritization.

Examples: A score of 17 to 24 could be considered high-priority risk
9 to 16 could be considered moderate-priority risk
0 to 8 could be considered low-priority risk

**Adapted from materials provided by the Disaster Management Area D Coordinator.**

**Definitions for Hazard Prioritization**

**Magnitude -** Physical and economic greatness (impact) of the event

Factors to consider:

- Size of event
- Threat of life
- Threat to Property
  1. Individual
  2. Public sector
  3. Business and manufacturing
  4. Tourism

**Duration -** The length of time the disaster and the effects of the disaster last

Factors to consider:

- Length of physical duration during emergency phase
- Length of threat to life and property
- Length of physical duration during recovery phase
- Length of effects on individual citizen and community recovery
- Length of effects on economic recovery, tax base, business and manufacturing recovery, tourism, threat to tax base and threat to employment

**Distribution -** The depth of the effects among all sectors of the community and State

Factors to consider:

- How wide spread across the stat and community are the effects of the disaster
- Are all sectors of the community affected equally or disproportionately

**Area Affected -**How large an area is physically threatened and potentially impaired by disaster risk

Factors to consider:

- Geographic area affected by primary event
- Geographic, physical, economic areas affected by primary risk and the potential secondary effects

**Frequency -** The historic and predicted rate of recurrence of a risk caused event (generally expressed in years such as the 100 year flood)

Factors to consider:

- Historic events and recurrences of events in a measured time frame
- Scientifically based predictions of an occurrence of an event in a given period of time

**Degree of Vulnerability -** How susceptible is the population, community infrastructure and state resources to the effects of the risk.

Factors to consider:

- History of the impact of similar events
- Mitigation steps taken to lessen impact
- Community and State preparedness to respond to and recover from the event

**Community Priorities -** The importance placed on a particular risk by the citizens and their elected officials:

- Willingness to prepare for and respond to a particular risk
- Cultural significance of the threat and associated risks
- Opportunity to mitigate for one risk before others due to resource availability
- Distribution of resources

# City of Diamond Bar - Risk Identification Matrix -Definition

The Risk Identification Matrix summarizes the types of risks to Diamond Bar's critical facilities and vulnerabilities associated with earthquake, wildfire, flooding and windstorm hazards. The purpose of the matrix is to summarize the conclusions from the comparison of natural hazards, critical facilities and vulnerabilities and to define the potential risks in additional detail.

For all categories of critical facilities and vulnerabilities, the matrix provides conclusions on the potential for a risk – three items are documented in the matrix:

- *Risk Description:* Identification of potential injury, property damage, emergency service needs and disruption of services and infrastructure.

- *Number of At-Risk Facilities:* Total number of at-risk facilities relative to the total number of facilities of that type in the City.

- *Community Impact Rating:* For each identified risk, a rating of LOW, MEDIUM and HIGH is assigned as relative indicator of potential impact to community function and essential services. The table below defines the rating. It should be noted that there is some minor variability in the ratings since some risks do not fit perfectly into the rating categories.

On the attached matrix the number of at-risk/critical facilities and the rating provided in parentheses and is listed as follows: (2 of 5, LOW).

## Community Impact Ratings for Risks from Natural Hazards

| Rating | Geographic Extent | Disruption of Emergency And Essential Services | Duration of Effects | Population Impacts* |
|---|---|---|---|---|
| *LOW* | Risk focused on Specific property or site | No disruption or extremely limited | Short-term | Low potential |
| *MEDIUM* | Risk may extend beyond site | Some disruption of services | Short-to long-term | Some potential |
| *HIGH* | Potential for widespread effects on community function and stability | Significant service disruption with extensive effects | Long-term | Significant potential for multiple incidents affecting many people |

* *Potential for injuries, fatalities or dislocation*

## Appendix C: Public Participation

Public Participation is a mandatory and essential component in the process of effective hazard mitigation planning. A strategic, multi-faceted public participation process establishes communication lines wherein residents, local stakeholders and emergency response and contract agencies can contribute their local knowledge and experience and help prioritize mitigation actions.

When initially framing the planning process for the NHMP the City of Diamond Bar integrated public participation into all steps to allow for ongoing input and feedback. In addition, a variety of outreach efforts were made to allow for participation by the diversity of interests in the City, including public workshops and meetings, a Planning Committee and special written and web site communications.

The components of the NHMP public participation program are outlined in the sections following below.

Planning Committee

A Planning Committee was formed for assistance with NHMP preparation. As displayed in Table A-1 the Planning Committee was comprised of approximately 25 representatives of City departments, school district, utility and emergency service providers and surrounding cities. A series of twice monthly meeting were conducted at strategic points in the planning process to allow the Planning Committee to review incremental materials and provide feedback based on their area of expertise and experience. In addition two City Council Study Sessions were held. Table A-2 displays the meeting dates and locations.

Table C-1

**City of Diamond Bar NHMP Planning Committee**

| Name | Agency | Name | Agency |
|---|---|---|---|
| Jim DeStefano<br>Deputy City Manager | City of Diamond Bar | Bob Rose<br>Director of Community Services | City of Diamond Bar |
| Dave Doyle<br>Deputy City Manager | City of Diamond Bar | David Liu<br>Director of Public Works | City of Diamond Bar |
| Dennis Tarango<br>Building Official | City of Diamond Bar | Carlos Chacon<br>Building & Safety Technician | City of Diamond Bar |
| Teresa Ilasin<br>Senior Management Analyst | City of Diamond Bar | Sharon Gomez<br>Senior Management Analyst – Public Works | City of Diamond Bar |
| Joe Maxey<br>Lieutenant | LA County Sheriffs | Thomas Page<br>Battalion Chief | LA County Fire Dept. |
| Leticia Pacillas<br>Community Liaison | LA County Fire Dept. | Ron Watson<br>Battalion Chief | LA County Fire Dept. |
| Ann Lungu<br>Associate Planner | City of Diamond Bar<br>Planning Department | April Blakey<br>Public Information Manager | City of Diamond Bar |
| John Bingham<br>Consultant | City of Diamond Bar | | |
| Walnut Valley Water Company Representative | | | |
| Gas Company Representative | | Gas Systems | |
| Edison Representative | Power Systems | | |
| Pomona Unified School District | | Amy Mc Elwain, Dir. Risk Man. | |
| Walnut Valley School District | | Brenda Hunemiller, Area D Coordinator, LACO | |

Table C-2

**Natural Hazard Mitigation Plan-Public Participation Meetings**

| **DATE** | **MEETING** |
|---|---|
| February 9, 2004 | Diamond Bar Natural Hazard Mitigation Plan (NHMP)<br>Planning Committee Meeting<br>Diamond Bar (DB) City Hall |
| February 19 | Disaster Management Area D Meeting, Disaster Mitigation Act 2000 (DMA 2K) Planning<br>Irwindale Chamber of Commerce |
| Feb. 23 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| March 2 | Area D, DMA 2K NHMP Toolkit Training<br>Azusa City Hall |
| March 8 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| March 22 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| April 5 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| April 15 | Area D, General and DMA 2K Meeting<br>Irwindale Chamber of Commerce |
| April 19 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| May 3 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| May 6 | City of Pomona NHMP Technical Action Committee Mtg.<br>Pomona City Hall |
| May 17 | DB NHMP Planning Committee Meeting<br>DB City Hall |

| DATE | MEETING |
|---|---|
| May 18 | Diamond Bar City Council Study Session on NHMP<br>Diamond Bar City Council Chambers |
| May 20 | Area D, General and DMA 2K Meeting<br>Irwindale Chamber of Commerce |
| June 1 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| June 9 | Pomona NHMP TAC Meeting<br>Pomona City Hall |
| June 14 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| June 24 | Pomona NHMP TAC Meeting & Public Meeting<br>Pomona City Hall |
| July 8 | Pomona NHMP TAC Meeting<br>Pomona City Hall |
| July 12 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| July 26 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| August 9 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| August 23 | DB NHMP Planning Committee Meeting<br>DB City Hall |
| September 13 | DB NHMP Planning Committee Meeting |
| September 21 | Diamond Bar City Council – Study Session NHMP Introduction<br>Diamond Bar City Council Chamber |
| October 5 | Diamond Bar City Council – Public Hearing NHMP Adoption |

# Appendix D: Resource Directory

The Resource Directory, provided by the Disaster Management Area D Coordinator, provides contact information for local, regional, state, and federal programs that are currently involved in hazard mitigation activities. The Hazard Mitigation Action Committee may refer to the organizations on the following pages for resources and technical assistance. The Resource Directory provides a foundation for potential partners in action item implementation.

**American Public Works Association**

Level: National Hazard: Multi
http://www.agwa.net
2345 Grand Boulevard Suite 500
Kansas City, MO 64108-2641
Ph: 816-472-1610 Fx: 816-472-1610
Notes: The American Public Works Association is an international educational and professional association of public agencies, private sector companies, and individuals dedicated to providing high quality public works goods and services.

**Association of State Floodplain Managers**

Level: Federal Hazard: Flood
www.floods.org
2809 Fish Hatchery Road
Madison, WI 53713
Ph: 608-274-0123
Notes: The Association of State Floodplain Managers is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning and recovery.

**Building Seismic Safety Council (BSSC)**

Level: National Hazard: Earthquake
www.bssconline.org
1090 Vermont Ave., NW Suite 700
Washington, DC 20005
Ph: 202-289-7800 Fx:202-289-109
Notes: The Building Seismic Safety Council (BSSC) develops and promotes building earthquake risk mitigation regulatory provisions for the nation.

**California Department of Transportation (CalTrans)**

Level: State Hazard: Multi
http://www.dot.ca.gov/
120 S. Spring Street
Los Angeles, CA 90012
Ph: 213- 897-3656
Notes: CalTrans is responsible for the design, construction, maintenance, and operation of the California State Highway System, as well as that portion of the Interstate Highway System within the state's boundaries. Alone and in partnership with Amtrak, CalTrans is also involved in the support of intercity passenger rail service in California.

**California Resources Agency**

Level: State Hazard: Multi
http://resources.ca.gov
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Ph: 916- 653-5656
Notes: The California Resources Agency restores, protects and manages the state's natural, historical and cultural resources for current and future generations using solutions based on science, collaboration and respect for all the communities and interests involved.

**California Division of Forestry (CDF)**

Level: State Hazard: Multi

http://www.fire.ca.gov/php/index.php
210 W. San Jacinto
Perris CA 92570
Ph: 909-940-6900
Notes: The California Department of Forestry and Fire Protection protects over 31 million acres of California's privately-owned wildlands. CDF emphasizes the management and protection of California's natural resources.

**California Division of Mines and Geology (DMG)**

Level: State Hazard: Multi

www.consrv.ca.gov/cgs/index.htm
801 K Street
Sacramento, CA 95814
Ph: 916-445-1825 Fx: 916-445-5718
Notes: The California Geological Survey develops and disseminates technical information and advice on California's geology, geological hazards, and mineral resources.

**California Environmental Resources Evaluation System (CERES)**

Level: State Hazard: Multi

**http://ceres.ca.gov/ State**
900 N St. Suite 250
Sacramento, Ca. 95814

Ph: 916- Fx: 653-2238
Notes: CERES is an excellent website for access to environmental information and websites.

**California Department of Water Resources (DWR)**

Level: State Hazard: Flood
1416 9th Street
Sacramento, CA 95814
http://wwwdwr.water.c a.gov

Ph: 916-653-6192
Notes: The Department of Water Resources manages the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.

**California Department of Conservation: Southern California Regional Office**
Level: State Hazard: Multi
**www.consrv.ca.gov**
655 S. Hope Street #700
Los Angeles, CA 90017-2321

Ph: 213-239-0878 Fx: 213-239-0984
Notes: The Department of Conservation provides services and information that promote environmental health, economic vitality, informed land-use decisions and sound management of our state's natural resources.

**California Planning Information Network**
Level: State Hazard: Multi
www.calpin.ca.gov
Notes: The Governor's Office of Planning and Research (OPR) publishes basic information on local planning agencies, known as the California Planners' Book of Lists. This local planning information is available on-line with new search capabilities and up-to-the- minute updates.

**EPA, Region 9**
Level: Regional Hazard: Multi
http://www.epa.gov/region09
75 Hawthorne Street
San Francisco CA 94105
Ph: 415-947-8000 Fx: 415-947-3553
Notes: The mission of the U.S. Environmental Protection Agency is to protect human health and to safeguard the natural environment through the themes of air and global climate change, water, land, communities and ecosystems, and compliance and environmental stewardship.

**Federal Emergency Management Agency, Region IX**
Level: Federal Hazard: Multi
1111 Broadway Suite 1200
Oakland, CA 94607
Ph: 510-627-7100 Fx: 510-627-7112
www.fema.gov
Notes: The Federal Emergency Management Agency is tasked with responding to, planning for, recovering from and mitigating against disasters.

**Federal Emergency Management Agency, Mitigation Division**
Level: Federal Hazard: Multi
500 C Street, S.W.
Washington, D.C. 20472
Ph: 202-566-1600
www.fema.gov/fima/planhowto.shtm
Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.

**Floodplain Management Association**
Level: Federal Hazard: Flood
P.O. Box 50891
Sparks, NV 89435-0891
Ph: 775-626-6389 Fx: 775-626-6389
www.floodplain.org
Notes: The Floodplain Management Association is a nonprofit educational association. It was established in 1990 to promote the reduction of flood losses and to encourage the protection and enhancement of natural floodplain values. Members include representatives of federal, state and local government agencies as well as private firms.

**Gateway Cities Partnership**
Level: Regional Hazard: Multi
7300 Alondra Boulevard Suite 202
Paramount, CA 90723
Ph: 562-817-0820

www.gatewaycities.org
Notes: Gateway Cities Partnership is a 501 C 3 non-profit Community Development Corporation for the Gateway Cities region of southeast LA County. The region comprises 27 cities that roughly speaking extends from Montebello on the north to Long Beach on the South, the Alameda Corridor on the west to the Orange County line on the east.

**Governor's Office of Emergency Services (OES)**
Level: State Hazard: Multi
www.oes.ca.gov
P.O. Box 419047
Rancho Cordova, CA
Ph: 916-845-8911 Fx: 916-845-8910
Notes: The Governor's Office of Emergency Services coordinates overall state agency response to major disasters in support of local government. The office is responsible for assuring the state's readiness to respond to and recover from natural, manmade, and war-caused emergencies, and for assisting local governments in their emergency preparedness, response and recovery efforts.
Notes: The Greater Antelope Valley Economic Alliance, (GA VEA) is a 501 (c) (6) nonprofit organization with a 501(c)(3) affiliated organization the Antelope Valley Economic Research and Education Foundation. GA VEA is a public private partnership of business, local governments, education, non-profit organizations and health care organizations that was founded in 1999 with the goal of attracting good paying jobs to the Antelope Valley in order to build a sustainable economy.

**Greater Antelope Valley Economic Alliance**
Level: Regional Hazard: Multi
42060 N. Tenth Street West
Lancaster, CA 93534
Ph: 661-945-2741 Fx: 661-945-7711

**Landslide Hazards Program, USGS**
Level: Federal
Hazard: Landslide
http://landslides.usgs.gov/index.html
12201 Sunrise Valley Drive MS 906
Reston, VA 20192
Ph: 703-648-4000
Notes: The NLIC website provides good information on the programs and resources regarding landslides. The page includes information on the National Landslide Hazards Program Information Center, a bibliography, publications, and current projects. USGS scientists are working to reduce long-term losses and casualties from landslide hazards through better understanding of the causes and mechanisms of ground failure both nationally and worldwide.

**Los Angeles County Economic Development Corporation**
Level: Regional
Hazard: Multi
www.laedc.org
444 S. Flower Street
34th Floor
Los Angeles, CA 90071
Ph: 213-236-4813 Fx: 213-623-0281
Notes: The LAEDC is a private, non-profit 501 (c) 3 organization established in 1981 with the mission to attract, retain and grow businesses and jobs in the Los Angeles region. The LAEDC is widely relied upon for its Southern California Economic Forecasts and Industry Trend Reports. Lead by the renowned Jack Kyser (Sr. Vice President, Chief Economist) his team of researchers produces

numerous publications to help business, media and government navigate the LA region's diverse economy.

**Los Angeles County Public Works Department**
Level: County Hazard: Multi
http://ladpw.org
900 S. Fremont Ave.
Alhambra, CA 91803
Ph: 626-458-5100
Notes: The Los Angeles County Department of Public Works protects property and promotes public safety through Flood Control, Water Conservation, Road Maintenance, Bridges, Buses and Bicycle Trails, Building and Safety, Land Development, Waterworks, Sewers, Engineering, Capital Projects and Airports.

**National Wildland/Urban Interface Fire Program**
Level: Federal Hazard: Wildfire
1 Batterymarch Park
Quincy, MA 02169-7471
www.firewise.org/
Ph: 617-770-3000
Fx: 617-770-0700
Notes: Firewise maintains a Website designed for people who live in wildfire- prone areas, but it also can be of use to local planners and decision makers. The site offers online wildfire protection information and checklists, as well as listings of other publications, videos, and conferences.

**National Resources Conservation Service**
Level: Federal
Hazard: Multi
http://www.nrcs.usda.gov
14th and Independence Ave., SW
Washington 20250, DC
Room 5105-A
Ph: 202-720-7246 Fx: 202-720-7690
Notes: NRCS assists owners of America's private land with conserving their soil, water, and other natural resources, by delivering technical assistance based on sound science and suited to a customer's specific needs. Cost shares and financial incentives are available in some cases.

**National Interagency Fire Center (NIFC)**
Level: Federal Hazard: Wildfire
www.nifc.gov
3833 S. Development Ave.
Boise, Idaho 83705
Ph: 208-387-5512
Notes: The NIFC in Boise, Idaho is the nation's support center for wildland firefighting. Seven federal agencies work together to coordinate and support wildland fire and disaster operations.

**National Fire Protection Association (NFPA)**
Level: National Hazard: Wildfire
1 Batterymarch Park
Quincy, MA 02169-7471
Ph: 617-770-3000 Fx: 617-770-0700
Notes: The mission of the international nonprofit NFPA is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating scientifically-based consensus codes and standards, research, training and education.

**National Floodplain Insurance Program (NFIP)**
Level: National Hazard: Flood
www.fema_gov/nfin/ Federal Flood
500 C Street, S.W.
Washington, D.C. 20472
http://www.fema.org
Ph: 202-566-1600
Notes: The Mitigation Division manages the National Flood Insurance Program and oversees FEMA's mitigation programs. It has of a number of programs and activities of which provide citizens Protection, with flood insurance; Prevention, with mitigation measures and Partnerships, with communities throughout the country.

**National Oceanic /Atmospheric Administration**
Level: Federal Hazard: Multi
www.noaa.gov
14th Street & Constitution Ave NW Rm 6013
Washington, DC 20230
Ph: 202- Fx:202-482-6090 Fx: 202-482-3154
Notes: NOAA's historical role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship.

**National Weather Service, Office of Hydrologic Development**
Level: Federal
Hazard: Flood
http://www.nws.noaa.gov
1325 East West Highway SSMC2
Silver Spring, MD 20910
Ph: 301-713-1658 Fx: 301-713-0963
Notes: The Office of Hydrologic Development (OHD) enhances National Weather Service products by: infusing new hydrologic science, developing hydrologic techniques for operational use, managing hydrologic development by NWS field office, providing advanced hydrologic products to meet needs identified by NWS customers.

**National Weather Service**
http://www.nws.noaa.g
Level: Federal Hazard: Multi
520 North Elevar Street
Oxnard, CA 93030
Ph: 805-988-6615
Notes: The National Weather Service is responsible for providing weather service to the nation. It is charged with the responsibility of observing and reporting the weather and with issuing forecasts and warnings of weather and floods in the interest of national safety and economy. Briefly, the priorities for service to the nation are: 1. protection of life, 2. protection of property, and 3. promotion of the nation's welfare and economy.

**San Gabriel Valley Economic Partnership**
Level: Regional Hazard: Multi
www.valleynet.org
4900 Rivergrade Road Suite A310
Irwindale, CA 91706
Notes: The San Gabriel Valley Economic Partnership is a non-profit corporation representing both public and private sectors. The Partnership is the exclusive source for San Gabriel Valley specific information, expertise, consulting, products, services, and events. It is the single organization in the Valley with the mission to sustain and build the regional economy for the mutual benefit of all thirty cities, chambers of commerce, academic institutions, businesses and residents.

**Sanitation Districts of Los Angeles County**
Level: County Hazard: Flood
1955 Workman Mill Road
Whittier, CA 90607
http://www.lacsd.org
Ph: 562-699-7411 x2301
Notes: The Sanitation Districts provide wastewater and solid waste management for over half the population of Los Angeles County and turn waste products into resources such as reclaimed water, energy, and recyclable materials.

**Santa Monica Mountains Conservancy**
Level: Regional
Hazard: Multi
http://smmc.ca.gov/
570 West Avenue Twenty-Six Suite 100
Los Angeles, CA 90065
Ph: 323-221-8900
Notes: The Santa Monica Mountains Conservancy helps to preserve over 55,000 acres of parkland in both wilderness and urban settings, and has improved more than 114 public recreational facilities throughout Southern California.

**South Bay Economic Development Partnership**
Level: Regional Hazard: Multi
www.southbaypartners hip com
3858 Carson Street Suite 110
Torrance, CA 90503
Ph: 310-792-0323 Fx: 310-543-9886
Notes: The South Bay Economic Development Partnership is a collaboration of business, labor, education and government. Its primary goal is to plan an implement an economic development and marketing strategy designed to retain and create jobs and stimulate economic growth in the South Bay of Los Angeles County.

**South Coast Air Quality Management District (AQMD)**
Level: Regional Hazard: Multi
www.aqmd.gov
21865 E. Copley Drive
Diamond Bar, CA 91765
Ph: 800-CUT-SMOG
Notes: AQMD is a regional government agency that seeks to achieve and maintain healthful air quality through a comprehensive program of research, regulations, enforcement, and communication. The AQMD covers Los Angeles and Orange Counties and parts of Riverside and San Bernardino Counties.

**Southern California Earthquake Center (SCEC)**
Level: Regional Hazard: Earthquake

3651 Trousdale Parkway Suite 169
Los Angeles, CA 90089-0742
www.scec.org
Notes: The Southern California Earthquake Center (SCEC) gathers new information about earthquakes in Southern California, integrates this information into a comprehensive and predictive understanding of earthquake phenomena, and communicates this understanding to end-users and the general public in order to increase earthquake awareness, reduce economic losses, and save lives.

**Southern California Association of Governments (SCAG)**
Level: Regional
Hazard: Multi
www.scag.ca.gov
818 W. Seventh Street, 12th Floor
Los Angeles, CA 90017
Ph: 213-236-1800 Fx: 213-236-1825
Notes: The Southern California Association of Governments functions as the Metropolitan Planning Organization for six counties: Los Angeles, Orange, San Bernardino, Riverside, Ventura and Imperial. As the designated Metropolitan Planning Organization, the Association of Governments is mandated by the federal government to research and draw up plans for transportation, growth management, hazardous waste management, and air quality.

**State Fire Marshal (SFM)**
Level: State Hazard: Wildfire
http://osfm.fire.ca.gov
1131 "S" Street
Sacramento, CA 95814
Ph: 916-445-8200 Fx: 916-445-8509
Notes: The Office of the State Fire Marshal (SFM) supports the mission of the California Department of Forestry and Fire Protection (CDF) by focusing on fire prevention. SFM regulates buildings in which people live, controls substances which may, cause injuries, death and destruction by fire; provides statewide direction for fire prevention within wildland areas; regulates hazardous liquid pipelines; reviews regulations and building standards; and trains and educates in fire protection methods and responsibilities.

**The Community Rating System (CRS)**
Level: Federal Hazard: Flood
http://www.fema.gov/ nfip/crs.shtm
500 C Street, S.W.
Washington, D.C.
Ph: 202-566-1600
Notes: The Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimum requirements of the NFIP. Property owners within the County would receive reduced NFIP flood insurance premiums if the County implements floodplain management practices that qualify it for a CRS rating. For further information on the CRS, visit FEMA's website.

**United States Geological Survey**
Level: Federal Hazard: Multi
http://www.usgs.gov
345 Middlefield Road
Menlo Park, CA 94025
Ph: 650-853-8300
Notes: The USGS provides reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

**US Army Corps of Engineers**

Level: Hazard: Federal Multi
P.O. Box 532711
Los Angeles CA 90053-2325
http://www.usace.army.mil
Ph: 213-452-3921
Notes: The United States Army Corps of Engineers work in engineering and environmental matters. A workforce of biologists, engineers, geologists, hydrologists, natural resource managers and other professionals provide engineering services to the nation including planning, designing, building and operating water resources and other civil works projects.

**USDA Forest Service**
Level: Hazard: Federal Wildfire
1400 Independence Ave. SW
http://www.fs.fed.us
Washington, D.C. 20250-0002
Ph: 202-205-8333
Notes: The Forest Service is an agency of the U.S. Department of Agriculture. The Forest Service manages public lands in national forests and grasslands.

**USGS Water Resources**
Level: Hazard: Federal Multi
www.water.usgs_.gov
6000 J Street
Placer Hall
Sacramento, CA 95819-6129
Ph: 916-278-3000 Fx: 916-278-3070
Notes: The USGS Water Resources mission is to provide water information that benefits the Nation's citizens: publications, data, maps, and applications software.

**Western States Seismic Policy Council (WSSPC)**
Level: Regional
Hazard: Earthquake
www.wsspc.org/home.html
125 California Avenue Suite D201, #1
Palo Alto, CA 94306
Ph: 650-330-1101 Fx: 650-326-1769
Notes: WSSPC is a regional earthquake consortium funded mainly by FEMA. Its website is a great resource, with information clearly categorized - from policy to engineering to education.

**Westside Economic Collaborative C/O Pacific Western Bank**
Level: Regional Hazard: Multi
http://www.westside-Ia.org
120 Wilshire Boulevard
Santa Monica CA 90401
Ph: 310-458-1521/Fx: 310-458-6479
Notes: The Westside Economic Development Collaborative is the first Westside regional economic development corporation. The Westside EDC functions as an information gatherer and resource center, as well as a forum, through bringing business, government, and residents together to address issues affecting the region: Economic Diversity, Transportation, Housing, Workforce Training and Retraining, Lifelong Learning, Tourism, and Embracing Diversity.

## Appendix E: Economic Analysis Guidelines for Natural Hazard Mitigation Projects

Benefit/cost analysis is a key mechanism used by the state Office of Emergency Services (OES), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

This appendix outlines several approaches for conducting economic analysis of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, (Oregon State Police - Office of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, Report on Costs and Benefits of Natural Hazard Mitigation.

This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to provide the details of economic analysis methods that can be used to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

### PURPOSE

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred.

Evaluating natural hazard mitigation provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools.

Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce "ripple-effects" throughout the community, greatly increasing the disaster's social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

City of Diamond Bar Natural Hazards Mitigation Plan Appendix C. Economic Analysis Guidelines for Natural Hazard Mitigation Projects

### ECONOMIC ANALYSIS APPROACHES FOR MITIGATION STRATEGIES

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost effectiveness analysis. The distinction between the two methods is the way in which the relative costs and benefits are measured. Additionally, there are varying approaches to assessing the value of mitigation for public sector and private sector activities.

**Benefit/Cost Analysis**

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoided future damages, and risk.

In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented (i.e., if net benefits exceed net costs, the project is worth pursuing). A project must have a benefit/cost ratio greater than 1 in order to be funded.

**Cost-Effectiveness Analysis**

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

*Investing public sector mitigation activities*

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions that involve a diverse set of beneficiaries and nonmarket benefits.

*Investing in private sector mitigation activities*

Private sector mitigation projects may occur on the basis of one of two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

- Request cost sharing from public agencies;
- Dispose of the building or land either by sale or demolition;
- Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
- Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchasers. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

## CONDUCTING AN ECONOMIC ANALYSIS

Benefit/cost analysis and cost-effectiveness analysis are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating alternative mitigation activities is outlined below:

1. **Identify the Alternatives.** Alternatives for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation project can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. **Calculate the Costs and Benefits.** Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate alternative. Potential economic criteria to evaluate alternatives include:

- *Determine the project cost.* This may include initial project development costs, and repair and operating costs of maintaining projects over time.

- *Estimate the benefits.* Projecting the benefits or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- *Consider costs and benefits to society and the environment.* These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.

- *Determine the correct discount rate.* Determination of the discount rate can just be the risk free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. **Analyze and Rank the Alternatives.** Once costs and benefits have been quantified, economic analysis tools can rank the alternatives. Two methods for determining the best alternative given varying costs and benefits include net present value and internal rate of return.

- *Net present value.* Net present value is the value of the expected future returns of an investment minus the value of expected future cost ex pressed in today's dollars. If the net present value is greater than the project costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.

- *Internal Rate of Return.* Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in

alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project.

Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk; project effectiveness; and economic, environmental, and social returns in choosing the appropriate project for implementation.

## ECONOMIC RETURNS OF NATURAL HAZARD MITIGATION

The estimation of economic returns, which accrue to building or landowner as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

## ADDITIONAL COSTS FROM NATURAL HAZARDS

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic

impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

## ADDITIONAL CONSIDERATIONS

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. Many communities are looking; towards developing multi-objective projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

## RESOURCES

The following resources for economic analysis have been provided by the Disaster Management Area D. Coordinator.

CUREe Kajima Project, Methodologies For Evaluating The Socio-Economic Consequences Of Large Earthquakes, Task 7.2 Economic Impact Analysis, Prepared by University of California, Berkeley Team, Robert A. Olson, VSP Associates, Team Leader; John M. Eidinger, G&E Engineering Systems; Kenneth A. Goettel, Goettel and Associates Inc.; and Gerald L. Horner, Hazard Mitigation Economics Inc., 1997.

Federal Emergency Management Agency, Benefit/Cost Analysis of Hazard Mitigation Projects, Riverine Flood, Version 1.05, Hazard Mitigation Economics Inc., 1996.

Federal Emergency Management Agency Report on Costs and Benefits of Natural Hazard Mitigation. Publication 331, 1996.

Goettel & Horner Inc., Earthquake Risk Analysis Volume III: The Economic Feasibility of Seismic Rehabilitation of Buildings in The City of Portland, Submitted to the Bureau of Buildings, City of Portland, August 30, 1995.

Goettel & Horner Inc., Benefit/Cost Analysis of Hazard Mitigation Projects Volume V, Earthquakes, Prepared for FEMA's Hazard Mitigation Branch, October 25, 1995.

Horner, Gerald, Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures, Robert Olson Associates, Prepared for Oregon State Police, Office of Emergency Management, July 1999.

Interagency Hazards Mitigation Team, State Hazard Mitigation Plan, (Oregon State Police - Office of Emergency Management, 2000).

Risk Management Solutions, Inc., Development of a Standardized Earthquake Loss Estimation Methodology, National Institute of Building Sciences, Volume I and II, 1994.

VSP Associates, Inc., A Benefit/Cost Model for the Seismic Rehabilitation of Buildings, Volumes 1 & 2, Federal Emergency Management Agency, FEMA, Publication Numbers 227 and 228, 1991.

VSP Associates, Inc., Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program, Volume 3: Seismic Hazard Mitigation Projects, 1993.

VSP Associates, Inc., Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model, Volume 1, Federal Emergency Management Agency, FEMA, Publication Number 255, 1994.

Source: Disaster Management Area D Coordinator

## APPENDIX F: Acronyms

Federal Acronyms

| | |
|---|---|
| AASHTO | American Association of State Highway and Transportation Officials |
| ATC | Applied Technology Council |
| BCA | Benefit/Cost Analysis |
| BFE | Base Flood Elevation |
| BLM | Bureau of Land Management |
| BSSC | Building Seismic Safety Council |
| CDBG | Community Development Block Grant |
| CFR | Code of Federal Regulations |
| CRS | Community Rating System |
| EDA | Economic Development Administration |
| EPA | Environmental Protection Agency |
| ER | Emergency Relief |
| EWP | Emergency watershed Protection |
| FAS | Federal Aid System |
| FEMA | Federal Emergency Management Agency |
| FIRM | Flood Insurance Rate Map |
| FTE | Full Time Equivalent |
| NOAA | National Oceanic and Atmospheric Administration |
| NPS | National Parks Service |
| NRCS | Natural Resources Conservation Service |
| NWS | National Weather Service |
| GIS | Geographic Information System |
| GNS | Institute of Geological and Nuclear Sciences (International) |
| GSA | General Services Administration |
| HAZUS | Hazard Mitigation Grant Program |
| HMGP | Hazard Mitigation Grant Program |
| HMST | Hazard Mitigation Survey Team |
| HUD | Housing and Urban Development Department (US Dept. of) |
| IBHS | Institute for Business and Home Safety |
| ICC | Increased Cost of Compliance |
| IHMT | Interagency Hazard Mitigation Team |
| NCDC | National Climate Data Center |
| NFIP | National Flood Insurance Program |
| NFPA | National Fire Protection Association |
| NHMP | National Hazard Mitigation Plan (also known as “409 Plan” or DMA2K) |
| NIBS | National Institute of Building Sciences |
| NIFC | National Interagency Fire Center |
| NMFS | National Marine Fisheries Service |
| NRM | Unreinforced Masonry |
| USACE | United States Army Corps of Engineers |
| USBR | United States Bureau of Reclamation |
| USDA | United States Department of Agriculture |
| USFA | United States Fire Administration |

| | |
|---|---|
| SBA | Small Business Administration |
| SEAO | Structural Engineers Association of Oregon |
| TOR | Transfer of Development Rights |
| UGB | Urban Growth Boundary |
| USFS | United States Forest Service |
| USGS | United States Geological Survey |
| WSSPC | Western States Seismic Policy Council |

California Acronyms

| | |
|---|---|
| A&W | Alert and Warning |
| AA | Administering Areas |
| AAR | After Action Report |
| ARC | American Red Cross |
| ARP | Accidental Risk Prevention |
| ATC21 | Applied Technology Council20 |
| ATC21 | Applied Technology Council21 |
| BCP | Budget Change Proposal |
| BSA | California Bureau of State Audits |
| CAER | Community Awareness & Emergency Response |
| CalARP | Cal. Accidental Release Prevention |
| CalBO | California Building Officials |
| CEPEC | California Earthquake Prediction Evaluation Council |
| CESRS | California Emergency Services Radio System |
| CHIP | California Hazardous Identification Program |
| CHMIRS | California Hazardous Materials Incident Reporting System |
| CHP | California Highway Patrol |
| CLETS | California Law Enforcement Telecommunications System |
| CalEPA | California Environmental Protection Agency |
| CalREP | California Radiological Emergency Plan |
| CALSTARS | California State Accounting Reporting System |
| CalTRANS | California Department of Transportation |
| CBO | Community Based Organization |
| CD | Civil Defense |
| CDF | California Department of Forestry and Fire Protection |
| CDMG | California Division of Mines and Geology |
| CEC | California Energy Commission |
| DPA | California Department of Personnel Administration |
| DPIG | Disaster Preparedness Improvement Grant |
| DR | Disaster Response |
| DSA | Division of the State Architect |
| DSW | Disaster Service Worker |
| DWR | California Dept. of Water Resources |
| EAS | Emergency Alerting System |
| EDIS | Emergency Digital Information System |

| | |
|---|---|
| CSTI | California Specialized Training Institute |
| CUEA | California Utilities Emergency Association |
| CUPA | Certified Unified Program Agency |
| DAD | Disaster Assistance Division (of The state Office of Emergency Services) |
| DFO | Disaster Field Office |
| DGS | California Department of General Services |
| DHSRHB | California Department of Health Services, Radiological Health Branch |
| DO | Duty Officer |
| DOC | Department Operation Center |
| DOE | Department of Energy (US) |
| DOF | California Department of Finance |
| DOJ | California Department of Justice |
| ESC | Emergency Services Coordinator |
| FAY | Federal Year Award |
| FDAA | Federal Disaster Assistance Admin. |
| FEAT | Governor's Flood Emergency Action Team |
| FEMA | Federal Emergency Management Agency |
| FFY | Federal Fiscal Year |
| FIR | Final Inspection Report |
| FIRESCOPE | Firefighting Resources of So. Calif. Organized for Potential Emergencies |
| EERI | Earthquake Engineering Research Institute |
| EMA | Emergency Management Assistance |
| EMI | Emergency Management Institute |
| EMMA | Emergency Managers Mutual Aid |
| EMS | Emergency Medical Services |
| EOC | Emergency Operation Center |
| EOP | Emergency Operation Plan |
| EPA | Environmental Protection Agency (US) |
| EPEDAT | Early Post Earthquake Damage Assessment Tool |
| EPI | Emergency Public Information |
| EPIC | Emergency Public Information Council |
| HMEP | Hazardous Materials Emergency Preparedness |
| HMGP | Hazard Mitigation Grant Program |
| IDE | Initial Damage Estimate |
| IA | Individual Assistance |
| IFG | Individual & Family Grant Program |
| IRG | Incident Response Geographic Information System |
| IPA | Information and Public Affairs (of state Office of Emergency Services) |
| LAN | Local Area Network |
| LEMMA | Law Enforcement Master Mutual Aid |
| LEPC | Local Emergency Planning Committee |
| MARAC | Mutual Aid Regional Action Council |

| | |
|---|---|
| FMA | Flood Management Assistance |
| FSR | Feasibility Study Report |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| HAZMAT | Hazardous Materials |
| HAZMIT | Hazardous Mitigation |
| HAZUS | Hazards United States (an Earthquake damage assessment prediction) |
| HAD | Housing and Community Development |
| HEICS | Hospital Emergency Planning Guidance |
| HIA | Hazard Identification and Analysis Unit |
| NPP | Nuclear Power Plant |
| NSF | National Science Foundation |
| NWS | National Weather Service |
| OA | Operational Area |
| OASIS | Operational Area Satellite Information System |
| OCC | Operations Coordination Center |
| OCD | Office of Civil Defense |
| OEP | Office of Emergency Planning |
| OES | California Governor's Office of Emergency Services |
| OSHPD | Office of Statewide Health Planning and Development |
| OSPR | Oil Spill Prevention and Response |
| PA | Public Assistance |
| MHID | Multihazard Identification |
| MOU | Memorandum of Understanding |
| NBC | Nuclear, Biological, Chemical |
| NEMA | National Emergency Management Agency |
| NEMIS | National Emergency Management Information System |
| NFIP | National Flood Insurance Program |
| NOAA | National Oceanic and Atmospheric Association |
| RADEF | Radiological Defense (program) |
| RAMP | Regional Assessment of Mitigation Priorities |
| RAPID | Railroad Accident Prevention & Immediate Deployment |
| RDO | Radiological Defense Officer |
| RDMHC | Regional Disaster Medical Health Coordinator |
| REOC | Regional Emergency Operations Center |
| REPI | Reserve Emergency Public Information |
| RES | Regional Emergency Staff |
| RIMS | Response Information Management System |
| RMP | Risk Management Plan |
| RPU | Radiological Preparedness Unit (OES) |
| SONGS | San Onofre Nuclear Generating Station |
| SOP | Standard Operating Procedure |

| | |
|---|---|
| PC | Personal Computer |
| PDA | Preliminary Damage Assessment |
| PIO | Public Information Officer |
| POST | Police Officer Standards and Training |
| PPA/CA | Performance Partnership Agreement/Cooperative Agreement (FEMA) |
| PSA | Public Service Announcement |
| PTAB | Planning and Technological Assistance Branch |
| PTR | Project Time Report |
| RA | Regional Administration (OES) |
| RRT | Regional Response Team |
| SAM | State Administrative Manual |
| SARA | Superfund Amendments & Reauthorization Act |
| SAVP | Safety Assessment Volunteer Program |
| SBA | Small Business Administration |
| SCO | California State Controller's Office |
| SEMS | Standardized Emergency Management System |
| SEPIC | State Emergency Public Information Committee |
| SLA | State and Local Assistance |
| SWEPC | Statewide Emergency Planning |
| SWEPC | Statewide Emergency Planning Committee |
| TEC | Travel Expense Claim |
| TRU | Transuranic |
| TTT | Train the Trainer |
| UPA | Unified Program Account |
| UPS | Uninterrupted Power Source |
| USAR | Urban Search and Rescue |
| USGS | United States Geological Survey |
| WC | California State Warning Center |
| WAN | Wide Area Network |
| WIPP | Waste Isolation Pilot Project |

## Appendix G. Glossary

**Acceleration:** The rate of change of velocity with respect to time. Acceleration due to gravity at the earth's surface is 9.8 meters per second squared. That means that every second that something falls toward the surface of earth its velocity increases by 9.8 meters per second.

**Asset:** Any manmade or natural feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.

**Base Flood:** Flood that has a 1 percent probability of being equaled or exceeded in any given year. Also known as the 100year flood.

**Base Flood Elevation (BFE):** Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The Base Flood Elevation is used as the standard for the National Flood Insurance Program.

**Bedrock**: The solid rock that underlies loose material, such as soil, sand, clay, or gravel.

**Building:** A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

**Coastal High Hazard Area:** Area, usually along an open coast, bay, or inlet, that is subject to inundation by storm surge and, in some instances, wave action caused by storms or seismic sources.

**Coastal Zones**: The area along the shore where the ocean meets the land as the surface of the land rises above the ocean. This land/water interface includes barrier islands, estuaries, beaches, coastal wetlands, and land areas having direct drainage to the ocean.

**Community Rating System (CRS):** An NFIP program that provides incentives for NFIP communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of policyholders in these communities are reduced.

**Computer Aided Design and Drafting (CARD):** A computerized system enabling quick and accurate electronic 2-D and 3-D drawings, topographic mapping, site plans, and profile/cross-section drawings.

**Contour:** A line of equal ground elevation on a topographic (contour) map.

**Critical Facility:** Facilities that are critical to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.

**Debris:** The scattered remains of assets broken or destroyed in a hazard event. Debris caused by a wind or water hazard event can cause additional damage to other assets.

**Digitize**: To convert electronically points, lines, and area boundaries shown on maps into x, y coordinates (e.g., latitude and longitude, universal transverse mercator (UTM), or table coordinates) for use in computer applications.

**Displacement Time:** The average time (in days) which the building's occupants typically must operate from a temporary location while repairs are made to the original building due to damages resulting from a hazard event.

**Duration:** How long a hazard event lasts.

**Earthquake:** A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of earth's tectonic plates.

**Erosion:** Wearing away of the land surface by detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.

**Erosion Hazard Area:** Area anticipated to be lost to shoreline retreat over a given period of time. The projected inland extent of the area is measured by multiplying the average annual long-term recession rate by the number of years desired.

**Essential Facility:** Elements that are important to ensure a full recovery of a community or state following a hazard event. These would include: government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.

**Extent:** The size of an area affected by a hazard or hazard event.

**Extratropical Cyclone:** Cyclonic storm events like Nor'easters and severe winter low-pressure systems. Both West and East coasts can experience these nontropical storms that produce gale-force winds and precipitation in the form of heavy rain or snow. These cyclonic storms, commonly called Nor'easters on the East Coast because of the direction of the storm winds, can last for several days and can be very large - 1,000-mile wide storms are not uncommon.

**Fault:** A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are differentially displaced parallel to the plane of fracture.

**Federal Emergency Management Agency (FEMA):** Independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery.

**Fire Potential Index (FPI):** Developed by USGS and USFS to assess and map fire hazard potential over broad areas. Based on such geographic information, national policy makers and on-the-ground fire managers established priorities for prevention activities in the defined area to reduce the risk of managed and wildfire ignition and spread. Prediction of fire hazard shortens the time between fire ignition and initial attack by enabling fire managers to pre-allocate and stage suppression forces to high fire risk areas.

**Flash Flood:** A flood event occurring with little or no warning where water levels rise at an extremely fast rate.

**Flood:** A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.

**Flood Depth:** Height of the floodwater surface above the ground surface.

**Flood Elevation:** Elevation of the water surface above an established datum, e.g. National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or Mean Sea Level.

**Flood Hazard Area:** The area shown to be inundated by a flood of a given magnitude on a map.

**Flood Insurance Rate Map (FIRM):** Map of a community, prepared by the Federal Emergency Management Agency that shows both the special flood hazard areas and the risk premium zones applicable to the community.

**Flood Insurance Study (FIS):** A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.

**Floodplain:** Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.

**Frequency:** A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance - its probability - of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.

**Fujita Scale of Tornado Intensity:** Rates tornadoes with numeric values from FO to F5 based on tornado windspeed and damage sustained. An FO indicates minimal damage such as broken tree limbs or signs, while and F5 indicated severe damage sustained.

**Functional Downtime:** The average time (in days) during which a function (business or service) is unable to provide its services due to a hazard event.

**Geographic Area Impacted:** The physical area in which the effects of the hazard are experienced.

**Geographic Information Systems (GIS):** A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.

**Ground Motion:** The vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter, but soft soils can further amplify ground motions

**Hazard:** A source of potential danger or adverse condition. Hazards in this how to series will include naturally occurring events such as floods, earthquakes, tornadoes, tsunami, coastal storms, land when it has the potential to harm people or property.

**Hazard Event:** A specific occurrence of a particular type of hazard.

**Hazard Identification:** The process of identifying hazards that threaten an area.

**Hazard Mitigation:** Sustained actions taken to reduce or eliminate long-term risk from hazards and their effects.

**Hazard Profile:** A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps

**HAZUS (Hazards U.S.):** A GIS-based nationally standardized earthquake loss estimation tool developed by FEMA.

**Hurricane:** An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74miles-per-hour or more and blow in a large spiral around a relatively calm center or Ocean, or the south Pacific Ocean east of 160°E longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

**Hydrology:** The science of dealing with the waters of the earth. A flood discharge is developed by a hydrologic study.

**Infrastructure:** Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment facilities, and includes an area's transportation system such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, dry-docks, piers and regional dams.

**Intensity:** A measure of the effects of a hazard event at a particular place.

**Landslide:** Downward movement of a slope and materials under the force of gravity.

**Lateral Spreads:** Develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies in a seismic event. The phenomenon that occurs when ground shaking causes loose soils to lose strength and act like viscous fluid. Liquefaction causes two types of ground failure: lateral spread and loss of bearing strength.

**Liquefaction:** Results when the soil supporting structures liquefies. This can cause structures to tip and topple.

**Lowest Floor:** Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure.

**Magnitude:** A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.

**Mitigation Plan:** A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the state and includes a description of actions to minimize future vulnerability to hazards.

**Manufactured Home:** A structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities.

**Mobile Home:** A trailer, transportable in one or more sections which is over eight feet in width and 40 feet in length, with or without a permanent foundation and not including recreational vehicle, commercial coach or factory built housing.

**National Flood Insurance Program (NFIP):** Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 CFR §60.3.

**National Geodetic Vertical Datum of 1929 (NGVD):** Datum established in 1929 and used in the NFIP as a basis for measuring flood, ground, and structural elevations, previously referred to as Sea Level Datum or Mean Sea Level. The Base Flood Elevations shown on most of the Flood Insurance Rate Maps issued by the Federal Emergency Management Agency are referenced to NGVD.

**National Weather Service (NWS):** Prepares and issues flood, severe weather, and coastal storm warnings and can provide technical assistance to Federal and state entities in preparing weather and flood warning plans.

**Nor'easter:** An extra-tropical cyclone producing gale-force winds and precipitation in the form of heavy snow or rain.

**Outflow:** Follows water inundation creating strong currents that rip at structures and pound them with debris, and erode beaches and coastal structures.

**Planimetric:** Describes maps that indicate only man-made features like buildings.

**Planning:** The act or process of making or carrying out plans; the establishment of goals, policies and procedures for a social or economic unit.

**Probability:** A statistical measure of the likelihood that a hazard event will occur.

**Recurrence Interval:** The time between hazard events of similar size in a given location. It is based on the probability that the given event will be equaled or exceeded in any given year.

**Repetitive Loss Property:** A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1000 each have been paid within any 10-year period since 1978.

**Replacement Value:** The cost of rebuilding a structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality.

**Richter Scale:** A numerical scale of earthquake magnitude devised by seismologist C.F. Richter in 1935.

**Risk:** The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

**Riverine:** Of or produced by a river.

**Scale:** A steep slope.

**Scarp:** A proportion used in determining a dimensional relationship; the ratio of the distance between two points on a map and the actual distance between the two points on the earth's surface.

**Scour:** Removal of soil or fill material by the flow of floodwaters. The term is frequently used to describe storm induced, localized conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.

**Seismicity:** Describes the likelihood of an area being subject to earthquakes.

**Special Flood Hazard Area (SFHA):** An area within a floodplain having a 1 percent or greater chance of flood occurrence in any given year (100-year floodplain); represented on Flood Insurance Rate Maps by darkly shaded areas with zone designations that include the letter A or V.

**Stafford Act:** The Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-107 was signed into law November 23, 1988 and amended the Disaster Relief Act 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.

**State Hazard Mitigation Officer (SHMO):** The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local units of government in the planning and implementation of pre- and post- disaster mitigation activities.

**Storm Surge:** Rise in the water surface above normal water level on the open coast due to the action of wind stress and atmospheric pressure on the water surface.

**Structure:** Something constructed. (See also Building)

**Substantial Damage:** Damage of any origin sustained by a structure in a Special Flood Hazard Area whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage.

**Super Typhoon:** A typhoon with maximum sustained winds of 150 mph or more.

**Surface Faulting:** The differential movement of two sides of a fracture - in other words, the location where the ground breaks apart. The length, width, and displacement of the ground characterize surface faults.

**Tectonic Plate:** Torsionally rigid, thin segments of the earth's lithosphere that may be assumed to move horizontally and adjoin other plates. It is the friction between plate boundaries that cause seismic activity.

**Topographic:** Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include manmade features.

**Tornado:** A violently rotating column of air extending from a thunderstorm to the ground.

**Tropical Cyclone:** A generic term for a cyclonic, low-pressure system over tropical or subtropical waters.

**Tropical Depression:** A tropical cyclone with maximum sustained winds of less than 39 mph.

**Tropical Storm:** A tropical cyclone with maximum sustained winds greater than 39 mph and less than 74 mph.

**Tsunami:** Great sea wave produced by submarine earth movement or volcanic eruption.

**Typhoon:** A special category of tropical cyclone peculiar to the western North Pacific Basin, frequently affecting areas in the vicinity of Guam and the North Mariana Islands. Typhoons whose maximum sustained winds attain or exceed 150 mph are called super typhoons.

**Vulnerability:** Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power - if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.

**Vulnerability Assessment:** The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.

**Water Displacement:** When a large mass of earth on the ocean bottom sinks or uplifts, the column of water directly above it is displaced, forming the tsunami wave. The rate of displacement, motion of the ocean floor at the epicenter, the amount of displacement of the rupture zone, and the depth of water above the rupture zone all contribute to the intensity of the tsunami.

**Wave Runup:** The height that the wave extends up to on steep shorelines, measured above a reference level (the normal height of the sea, corrected to the state of the tide at the time of wave arrival).

**Wildfire:** An uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.

**Zone:** A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.

Source: Disaster Management Area D Coordinator, 2004.

**Agenda No. 7.1**

CITY COUNCIL AGENDA REPORT

TO: Honorable Mayor and Members of the City Council

VIA: Linda C. Lowry, City Manager

TITLE: Adopt Resolution No. 2004 – XX Adopting the Natural Hazards Mitigation Plan In Accordance With the Federal Disaster Mitigation Act of 2000 (Public Law 106-390)

RECOMMENDATION:

Approve.

FISCAL IMPACT:

There is no fiscal impact related to this item.

BACKGROUND / DISCUSSION:

The Disaster Mitigation Act of 2000 (DMA 2000) requires that all local agencies must have a local Natural Hazards Mitigation Plan in place to be eligible for both pre and post disaster federal funding. A Natural Hazards Mitigation Plan is a comprehensive document that identifies potential natural hazards, the extent of risk posed by these hazards, the vulnerabilities of the City to these hazards and the actions the City may take to mitigate or reduce the potential impact of the hazards. The local mitigation plan process places emphasis on reducing risk and ensuring effects from natural hazards through pre-event risk identification, assessment and mitigation. This process shifts much of the emphasis from the typical Public Safety oriented disaster response approach to a Community Development (Planning, Building, Public Works, Engineering, etc.) oriented disaster mitigation approach.

The City of Diamond Bar has undertaken completion of the Plan in order to meet a mandate set forth by the Federal Emergency Management Agency (FEMA). The Federal government is no longer willing to pay for repetitive disaster damage or damage that can be easily averted by pre-event actions. The local mitigation plan process places emphasis on reducing risk and ensuing effects from natural hazards through pre-event risk identification, assessment and mitigation. Not only does this Plan better prepare the City to anticipate and organize for a natural disaster, it will ensure the City receives the most assistance possible in the unfortunate and unlikely event of any such disaster.

The local mitigation plan is the representation of Diamond Bar's commitment to reduce risks from natural hazards and serves as a guide for decision makers as they commit resources toward reducing

the effects of natural hazards. The City must complete this comprehensive mitigation plan by November 1, 2004 pursuant to the FEMA guidelines in order to be eligible to receive project grants and reimbursement for declared local emergencies and disasters such as earthquakes, landslides, floods, wildfires and windstorms.

Completion and implementation of the Mitigation Plan is the result of several months of intense work in order to meet the FEMA deadline. Failure to implement a plan could have a devastating impact on a jurisdiction/agency in the event of a natural disaster. If an agency has not submitted a plan by the November deadline it would have to wait to submit until November 2005 and would not be eligible for FEMA funding for any natural disaster event occurring between the filing periods. The Plan also provides an implementation schedule and a five-year matrix for the future mitigation requirements.

The Natural Hazards Mitigation Plan document presented for adoption is an updated and improved version of the Draft Plan which was submitted to the Council on September 7, and reviewed at the Study Session held September 21, 2004. In addition, there was a Study Session held May 18 to outline and explain the Plan and the process for its implementation. The adopted Plan will be submitted to FEMA and the State Office of Emergency Services before the November 1, 2004 deadline.

Prepared by:

_____

John Bingham
Consultant

Approved by:

_____

James DeStefano
Deputy City Manager

Attachment: Natural Hazards Mitigation Plan

**RESOLUTION NO. 2004-57**

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF DIAMOND BAR ADOPTING THE NATURAL HAZARDS MITIGATION PLAN IN ACCORDANCE WITH THE FEDERAL DISASTER MITIGATION ACT OF 2000 (PUBLIC LAW 106-390)**

**WHEREAS,** In 2000 the Disaster Mitigation Act was enacted which required all public agencies to complete a Natural Hazards Mitigation Plan in accordance with guidelines set forth by the Federal Emergency Management Agency (FEMA);

**WHEREAS**, the City of Diamond Bar formed a Committee of city staff and local agency support personnel who worked diligently to complete the complex and comprehensive Plan;

**WHEREAS**, and the Plan identifies potential natural hazards and the extent of risk posed by said hazards, outlines actions the City can take to mitigate or reduce the potential impact of hazards and provides an implementation schedule for the years 2004-2009;

**WHEREAS**, There are actions that can be undertaken to address hazards, no matter how large or small, that can support disaster resiliency and sustainability in our community.

**NOW THEREFORE BE IT RESOLVED AND ORDERED** by the City Council of the City of Diamond Bar, as follows:

Section 1. The City Council of the City of Diamond Bar does hereby adopt the Natural Hazard Mitigation Plan, establishing goals and objectives to ensure the health, safety and welfare of its citizens, in the event of a natural disaster.

Section 2. The Natural Hazard Mitigation Plan comprised of a collection of policies and actions on how the community with grow and change in the future and will serve as a blueprint for how it can achieve sustainability and disaster resiliency. The plan will be the result of a process involving city departments, local agencies, business people, landowners, developers and citizens and will reflect local values and concerns.

Section 3. The Natural Hazard Mitigation Plan will meet the program criteria of the Disaster Mitigation Act of 2000 in order that the City of Diamond Bar will remain eligible for future pre-disaster and post-disaster mitigation program funds to ensure the health, safety and welfare of its citizens.

Section 4. The City Clerk shall certify to the passage and adoption of the resolution and the same shall thereupon take effect and is in force.

**APPROVED, PASSED AND ADOPTED** this 5th day of October, 2004.

_____

Bob Zirbes, Mayor

I, Linda C. Lowry, City Clerk of the City Diamond Bar, California, certify that this Resolution was adopted by the City Council at the regular meeting of the City Council held on October 5th, 2004, and was adopted by the following vote:

AYES:

NOES:

ABSTAIN:

ABSENT:

_____
Linda C. Lowry, City Clerk

**RESOLUTION 2004-57**

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF DIAMOND BAR ADOPTING THE NATURAL HAZARDS MITIGATION PLAN IN ACCORDANCE WITH THE FEDERAL DISASTER MITIGATION ACT OF 2000 (PUBLIC LAW 106-390)**

**WHEREAS,** In 2000 the Disaster Mitigation Act was enacted which required all public agencies to complete a Natural Hazards Mitigation Plan in accordance with guidelines set forth by the Federal Emergency Management Agency (FEMA);

**WHEREAS**, the City of Diamond Bar formed a Committee of city staff and local agency support personnel who worked diligently to complete the complex and comprehensive Plan;

**WHEREAS**, and the Plan identifies potential natural hazards and the extent of risk posed by said hazards, outlines actions the City can take to mitigate or reduce the potential impact of hazards and provides an implementation schedule for the years 2004-2009;

**WHEREAS**, There are actions that can be undertaken to address hazards, no matter how large or small, that can support disaster resiliency and sustainability in our community.

**NOW THEREFORE BE IT RESOLVED AND ORDERED** by the City Council of the City of Diamond Bar, as follows:

Section 1. The City Council of the City of Diamond Bar does hereby adopt the Natural Hazard Mitigation Plan, establishing goals and objectives to ensure the health, safety and welfare of its citizens, in the event of a natural disaster.

Section 2. The Natural Hazard Mitigation Plan comprised of a collection of policies and actions on how the community with grow and change in the future and will serve as a blueprint for how it can achieve sustainability and disaster resiliency. The plan will be the result of a process involving city departments, local agencies, business people, landowners, developers and citizens and will reflect local values and concerns.

Section 3. The Natural Hazard Mitigation Plan will meet the program criteria of the Disaster Mitigation Act of 2000 in order that the City of Diamond Bar will remain eligible for future pre-disaster and post-disaster mitigation program funds to ensure the health, safety and welfare of its citizens.

Section 4. The City Clerk shall certify to the passage and adoption of the resolution and the same shall thereupon take effect and is in force.

**APPROVED, PASSED AND ADOPTED** this 5th day of October, 2004.

Bob Zirbes, Mayor

I, Linda C. Lowry, City Clerk of the City Diamond Bar, California, certify that this Resolution was adopted by the City Council at the regular meeting of the City Council held on October 5th, 2004, and was adopted by the following vote:

| | | |
|---|---|---|
| AYES: | COUNCIL MEMBERS: | Chang, Huff, O'Connor, MPT/Herrera, M/Zirbes |
| NOES: | COUNCIL MEMBERS: | None |
| ABSTAIN: | COUNCIL MEMBERS: | None |
| ABSENT: | COUNCIL MEMBERS: | None |

Linda C. Lowry, City Clerk

STATE OF CALIFORNIA
COUNTY OF LOS ANGELES } SS
CITY OF DIAMOND BAR

I, LINDA C. LOWRY, CITY CLERK OF THE CITY OF DIAMOND BAR, DO HEREBY CERTIFY UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF CALIFORNIA THE FORGOING TO BE A FULL, TRUE AND CORRECT COPY OF THE ORIGINAL AS SAME APPEARS ON FILE IN MY OFFICE.

IN WITNESS WHEREON, I HAVE HEREUNTO SET MY HAND AND AFFIXED THE SEAL OF THE CITY OF DIAMOND BAR, THIS 6th DAY OF October, 2004.

LINDA C. LOWRY, CITY CLERK

BY Sam O. Cuba
DEPUTY

2004-57